PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOL. VIII, No. 2 FOR THE YEAR 1932 OCT., 1933

JANUARY 7, 1932

The 312th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association on January 7, 1932, at 2:30 p.m.

Members present: Messrs. Bianchi, Bryan, Carter, Chapman, Chock, Ehrhorn, Fullaway, Hagan, Illingworth, Ito, Keck, Marlowe, Mason, McBride, Pemberton, Olsen, Rosa, Sakimura, Smith, Swezey, Van Zwaluwenburg, Watt, Weinrich, Willard and Williams.

Visitors: Messrs. Blackman, Schmidt, Solander, Volck and Dr. Woltereck; Miss Dobroscky and Miss Suehiro.

President Chapman called the meeting to order.

The minutes of the preceding meeting were read and approved.

Mr. Fullaway stated that he had audited the Society's accounts for the year 1931, and found them to be correct.

The members of the Society and the visitors then went out in the grounds where a group photo was taken, then returned to the meeting room.

Mr. Swezey presented to the Society a picture of the staff of the H.S.P.A. Experiment Station for 1907, with the entomologists especially designated. Mr. Ehrhorn also presented a photograph of some entomologists.

Messrs. G. V. B. Herford, J. S. Phillips and Carl T. Schmidt were duly elected to Junior membership.

PAPERS

Dr. Carter reviewed a paper (to be published alsewhere) relating to the measuring of pineapple mealybug populations in the field and determination of their migration in from the edge of the

field. A considerable discussion re ants and mealybugs, ant traps, etc., followed.

President Chapman, having a business engagement, now turned over the meeting to Vice-President Hagan and the meeting continued.

Mr. Bryan introduced Dr. R. Woltereck, of the University of Leipzig, who is particularly interested in the small crustacea of fresh water (Entomostraca, Genetics of Cladocera). Dr. Woltereck made a brief statement of his work, which is genetical and ecological in character. He is going to the Orient and farther east to study lake faunas, etc.

NOTES AND EXHIBITION OF MATERIALS

**Cecidomyid from hibiscus buds.*—Mr. Swezey exhibited specimens of an undetermined cecidomyid reared from larvae in flower buds of hibiscus collected in the grounds of Mr. J. W. Waldron, Nuuanu Avenue, Honolulu, November 19, 1931. The buds had all fallen from a few bushes before opening, so that no flowers were being obtained. The adults began issuing December 4. On December 1, Mr. Swezey found infested buds on a hibiscus in his own garden in Manoa, from which adult midges issued December 19. He has searched for infested buds in other parts of the city, but to date had found none except in these two places. This is the first record of this immigrant insect in Honolulu. Specimens will be sent away for determination.

Hierodula patellifera (Serv.).—Mr. Swezey exhibited a specimen of this mantid which had recently been identified by Mr. Morgan Hebard of the Philadelphia Academy of Sciences. This mantid is the one recorded in Proc. Haw. Ent. Soc., VI, p. 11, 1925, as having been received from Waimea, Kauai, April 1, 1924. No more specimens have yet been collected, so far as known. The species occurs in Java and the Philippines.

Platyptilia brachymorpha Meyr.—Miss Suehiro reported that this pterophorid moth, which was identified by Mr. Swezey as *Playptilia brachymorpha* Meyr., was found quite numerous on ornamental snapdragon buds. This species has not been reported

* *Contarinia maculipennis* n. sp., described by Felt on page 247 of this issue. [Ed.]

from Oahu since Perkins captured it on Waialua beach in 1892. This is the first record of any food plant.

Hydrophorus sp.—Dr. Williams exhibited a specimen of this fly (Dolichopodidae) and its pupal shell. It breeds in the lowland mud flats, the larva feeding upon various dipterous larvae, while the adult was observed pulling blood-worms (Chironomus) out of watery mud, and holding them with forelegs and mouth, devouring them. The larva forms a cocoon and the pupa is extruded to disclose the adult. The adult fly skates on the water.

FEBRUARY 4, 1932

The 313th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on February 4, 1932, at 2:45 p.m.

Members present: Messrs. Bryan, Ehrhorn, Herford, Mason, Rosa, Schmidt, Swezey, Van Zwaluwenburg and Williams.

Visitors: Miss Dobroscky and Miss Suehiro.

In the absence of both the President and the Vice-President of the Society, Mr. E. M. Ehrhorn was chosen President pro tem.

The minutes of the previous meeting were read, corrected and approved.

Mr. Swezey, of the Photographs-of-Entomologists Committee, showed the three photos taken at the previous meeting of the Hawaiian Entomological Society and stated that they were ready for selection by members and suggested that they be paid for from the treasury of the Society. Mr. Van Zwaluwenburg suggested that the Society should keep a set of these three group pictures.

NOTES

Copris incertus var. *prociduus* (Say.).—Mr. Swezey reported that Mrs. Thompson, a science teacher at Punahou, last December 14, 1931, brought in for determination a specimen of this beetle which a pupil had collected at University Avenue. This would indicate that the beetle has become established on Oahu from small colonies that were liberated in the Punahou pasture, September 24 and October 27, 1930. It is the first recovery on Oahu, so far as known.

MARCH 3, 1932

The 314th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on March 3, at 2:35 p.m.

Members present: Messrs. Bianchi, Bryan, Ehrhorn, Fullaway, Hagan, Herford, Illingworth, Keck, Mason, Mitchell, Olsen, Rosa, Schmidt, Smith, Swezey, Van Zwaluwenburg, Weinrich, Wilder, Williams.

Vsitors: A. M. Adamson, Lex Brodie, O. Bryant, Dr. Irene D. Dobroscky, N. H. Krauss, W. F. Robertson, W. H. Volck and Dr. H. Yuasa.

The meeting was called to order by Vice-President Hagan.

The minutes of the preceding meeting were read and approved.

Photograph Committee.—Mr. Swezey circulated samples of the latest group photos of the Society for the signature of those who wanted the photographs. Mr. Ehrhorn on behalf of Mrs. W. M. Giffard presented the Society with an old photo that included Mr. A. Koebele, and another picture of Dr. F. A. G. Muir.

Dr. Gerrit P. Wilder presented the Society with a nearly complete set of the Fauna of Samoa.

PAPERS

Mr. Swezey on behalf of Dr. E. P. Felt presented a paper on **"A Hibiscus Bud Midge New to Hawaii."**

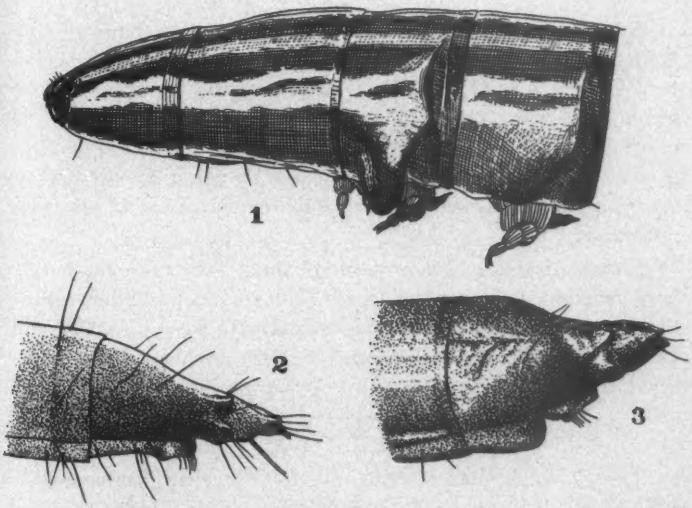
NOTES AND EXHIBITIONS

Mr. Adamson of the Pacific Entomologcal Survey spoke on the genus Rhyncogonus as represented in the Marquesas Islands. He exhibited material.

Mr. Bryant spoke of collecting insects for three summers in the Canadian Arctic. The eastern and the western faunas, probably with James Bay as a separator, were different.

Dr. Yuasa, of the Kyoto Agricultural College, spoke of entomological work in Japan, gave an interesting synopsis of some of the entomological journals there. Konshu = Insecta. Mushi = vernacular name for insect, "bug."

Prothetelous elaterid larva.—A prothetelous larva of *Simodactylus cinnamomeus* (Boisd.) from the H.S.P.A. collections, was exhibited by Mr. Van Zwaluwenburg. The specimen was taken in March, 1911, in cow dung at Grove Ranch, Maui, and is predominantly larviform with a carrying back of pupal characters into the larval stage. Fairly well developed wing-buds occur on the second thoracic segment, and less well developed ones on the third. In addition, the armature of the terminal abdominal segment is strongly reduced and simpler than in the normal larval condition, and seems to represent an approach to the terminal structure of the pupa. This is the second local case of prothetely in elaterids, Dr. F. X. Williams in 1925 having reported and figured a prothetelous *Monocrepidius exsul* Shp. (Proc. Haw. Ent. Soc., Vol. 6, p. 211).



Prothetelous larva of *Simodactylus cinnamomeus.*

1. Anterior end, lateral view.
2. Normal larva, posterior end, lateral view.
3. Prothetelous larva, posterior end, lateral view.

Mr. Swezey exhibited a collection of insects collected by himself and Dr. Williams in September and October, 1931, at Nauhi, Keanakolu and the higher slopes and summit of Mauna Kea, Hawaii.

Plagithmysus muiri Perkins.—A fine specimen of this endemic cerambycid beetle was exhibited by Mr. Swezey. It had just matured from a larva found in a Sideroxylon tree in Mohiakea Valley, Waianae Mts., January 3, 1932. It is the first time this beetle has been secured since its original rearing from a Sideroxylon tree in Haleauau Valley, November 11, 1926.

Plagithmysus kuhnsi Perkins.—A fine specimen of this beetle was also exhibited by Mr. Swezey. It had recently matured from a larva found in Pipturus tree in Haleauau Valley, Waianae Mts., January 3, 1932. Dead Pipturus trees are considerably bored by the larvae of this beetle in that valley, but the beetle is seldom reared.

Sympherobius barberi Banks.—Mr. Fullaway reported that Nathan Banks of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass., has determined the lace-wing fly introduced several years ago from Mexico to be this species. The insect has been reared in large numbers and liberated at various places, principally in pineapple fields, but though it has been recovered on several occasions its establishment is still somewhat uncertain.

Melanoxanthus melanocephalus (Fabr.).—Mr. Van Zwaluwenburg mentioned that in the H.S.P.A. Experiment Station collections is a specimen of this species, hitherto known locally only from Oahu, which was taken May 28, 1930, by Mr. O. H. Swezey at Olowalu, Maui. A new record of distribution.

APRIL 7, 1932

The 315th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on April 7, 1932, at 2:35 p.m.

Members present: Messrs. Adamson, Bryan, Carter, Chapman, Ehrhorn, Fullaway, Hagan, Herford, Illingworth, Ito, Keck, Mason, McBride, Mumford, Olsen, Rosa, Smith, Swezey and Van Zwaluwenburg.

Visitors: Lex Brodie, Dr. Irene Dobroscky, J. d'A. Northwood, Miss Amy Suehiro and Dr. Hachiro Yuasa.

The meeting was called to order by President Chapman. In the absence of the regular Secretary, Dr. Hagan was appointed as Secretary pro tem.

The minutes of the preceding meeting were read and approved, as corrected.

Photograph Committee.—Mr. Swezey passed group photographs again for orders from members.

Mr. Ehrhorn contributed photos of Dr. F. Muir and of several others.

Mr. Bryan suggested that a photograph of Dr. N. A. Cobb be added to the collection of photos of Hawaiian Entomologists. He had a photo.

Mr. Van Zwaluwenburg moved to approve sending "Proceedings" to Kyoto and Dr. Yuasa. The motion passed. Mr. N. H. Krauss was elected to Junior membership.

Mr. Henry Holmes, an attorney, submitted his resignation. Mr. Swezey spoke briefly of Mr. Holmes' history and connection with the Entomological Society. Mr. Fullaway moved to accept the resignation and to write a letter expressing appreciation of his past support. Passed.

Dr. Yuasa presented three books to the Society, as follows:

Manual Applied Zoology.

Illustrated Manual of Japanese plants, and a book on the Lepidoptera of Japan. Mr. Van Zwaluwenburg moved to accept these books with thanks. Passed.

Mr. Swezey discussed the problem of contributing "Proceedings" to sugar plantation managers (about 40). He moved that managers be informed that sets are available if they want them. Passed, and the Secretary was instructed so to inform them.

EXHIBITION OF, AND NOTES ON LOCAL MATERIAL

Plagithmysus cuneatus Sharp.—A specimen of this beetle was exhibited by Mr. Swezey, which had matured from a larva brought in March 20, from Niu Valley, where larvae were found by himself and Dr. Williams quite abundant in dying branches of *Sapindus oahuensis* trees. Several of the trees were found along the

trail that follows along the ewa side of the ridge that occupies the middle of the valley. They all showed exit holes of the beetle. Nine larvae and one pupa were collected from beneath bark, and about as many injured at the same time. The pupa died. One larva pupated March 21; 8 were put in holes in blocks of wood. The pupa became adult April 1, and took five days to become fully hardened and colored up. This is the first time that this beetle has been reared from its host tree. Three beetles had been collected by Forbes from this tree in Wailupe Valley in 1917. The first collecting of this species was by Dr. Perkins in the Waianae Mts. in 1893, but he did not know the tree from which they were collected.

Nausibius clavicornis (Kug.).—A specimen of this cucujid beetle was exhibited by Mr. Swezey, who had collected it under decaying bark of *Sapindus oahuensis* growing on Niu Ridge, March 20, 1932. This beetle was collected originally by Mr. Blackburn, and was said to be common in Honolulu. However, there are no records of it since Blackburn's collecting and this was the first time Mr. Swezey had taken it.

Margaronia cyanomichla Meyr.—A specimen of this pyraustid moth was exhibited by Mr. Swezey, who had reared it from a small larva on leaf of *Pseudomorus brunoniana*, Haleauau Valley, Waianae Mts., Oahu, March 13, 1932. The larva pupated March 25, 1932, and the moth issued April 5. This is the first discovery of the native host plant of this moth. The only previous rearing was from cultivated mulberry in the grounds of the Catholic Boys' School, Hilo, Hawaii, August 23, 1912.

Anagyrus saccharicola Timberlake.—Mr. Swezey reported that this encyrtid parasite on the pink sugar cane mealybug, introduced from the Philippines in 1930, has lately been found established and spread to all extremes on Ewa Plantation, Oahu Sugar Company and Honolulu Plantation. He had also found it established at Mapulehu, Molokai, April 4.

{*Diomus margipallens* (Muls.)
{*Scymnus pictus* Gorh.—Mr. Swezey reported that in March a few specimens of these ladybeetles were found in various fields of Ewa Plantation. They were introduced from Mexico in 1930

by the Board of Agriculture as enemies of the pineapple mealybug. They are thus now found to have taken to the cane mealybug.

Cryptorhyncus mangiferae (Fab.).—Mr. Swezey reported the collecting of one of these weevils on a fallen mango at Mapulehu, Molokai, April 4, 1932. He also found small larvae in seeds of fallen mangoes at Kawela, Molokai, the same day. These are the first records of the mango weevil on Molokai. It has been known on Oahu, Kauai, Maui and Hawaii for a long time.

Ceromasia sphenophori Vill.—Mr. Swezey reported finding the New Guinea tachinid parasite of the sugar cane borer in cane field at Mapulehu, Molokai, April 4, 1932. Apparently it had not previously been reported from that island.

Cryptotermes piceatus Snyder.—Mr. Bryan exhibited a framed picture so infested by Cryptotermes that even part of the print had been consumed.

Camponotus maculatus F, race *mitis* Sm., var. *hawaiiensis* F.—Mr. J. d'A. Northwood presented the following observations on this ant: Nest found about February 26, identified as above by Mr. E. H. Bryan. March 7, one queen, about six soldiers and a dozen winged immature queens and perhaps a hundred workers. Unable to find small slender males. About 75 pupa cases of varying sizes. No larvae. Workers tearing open pupae cases and eating pupae, also eating wings off living immature queens. Queen not laying.

April 3. Diluted honey acceptable, also cockroaches which they refused a week or two ago. This they take into nest and devour. When taking honey abdomen swells noticeably and on return to nest they feed the others. All pupae have now emerged (or been eaten) and last week a cluster of eggs arrived. More active in evenings.

Sting? When alarmed, abdomen is curled forward between legs until tip is presented to front. Also when alarmed they twitch strongly. Sight very poor, though eyes prominent.

Mr. E. M. Ehrhorn reported on the beginning of flights of termites. He said they are coming out earlier in the day this year than in the past.

EXHIBITION OF, AND NOTES ON FOREIGN MATERIAL

Mr. Bryan exhibited part of a collection of insects made by Professor F. L. Washburn of the University of Minnesota, in the Society and Marquesas Islands, 1922-1923 and 1925-1926. The specimens were sent to B. P. Bishop Museum for identification.

Mr. E. P. Mumford gave an example of *discontinuous geographical distribution in the Marquesas,* as follows:

Cyphogastra bedoci Théry (1926), a buprestid beetle at present thought to be endemic to the Marquesas and there restricted to the islands of Uapou and Fatuhiva.

In a MS. to be published shortly in the Pacific Entomological Survey Series, K. G. Blair of the British Museum distinguishes three varieties: *C. bedoci,* the typical form from Uapou, *C. bedoci* var. *obscura* from Fatuhiva, *C. bedoci* var. *cyanescens* from an unknown locality. Large series of the first two were taken by the Pacific Entomological Survey, the third variety *cyanescens* has been described from a few specimens submitted to the British Museum by Mr. Ahnne of Papeete.

The three forms vary in puncturation, coloration, apical spines, etc. They all show considerable variation in size, from 24-37 mm.

In Uapou, *C. bedoci* is known by the natives as *he.* In the other islands, the name is used to denote the stick insect, *Graeffea crouanii* (Le Guillou), commonly found on coconuts.

It commonly occurs on *taie, Terminalia catappa* (Combretaceae). This tree is widely distributed in the old-world tropics.

MAY 5, 1932

The 316th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on May 5, 1932, at 2:35 p.m.

Members present: Messrs. Adamson, Bryan, Bianchi, Carter, Chapman, Ehrhorn, Fullaway, Hagan, Illingworth, Keck, Krauss, Mason, Mumford, Olsen, Rosa, Schmidt, Smith, Swezey, Van Zwaluwenburg, Weinrich, Wilder and Williams.

Visitor: Miss Dobroscky.

President Chapman called the meeting to order.

The minutes of the preceding meeting were read and approved.

Mr. Swezey, representing the photo committee, distributed to members the latest photographs of the Society.

The Secretary-Treasurer brought up the question of membership dues; where the member was elected, for example, during the second, third or fourth quarter, should he pay full dues for that year, or only in proportion? Considerable discussion ensued. Dr. Illingworth then made a motion that the year of election be divided into quarters and that the member involved pay accordingly; 25 per cent for each quarter. Seconded.

More discussion; then a simplifying amendment was offered as follows: "that the payment of dues for the year of election be made on a semi-annual basis, full dues if elected on or before June 30th, or half dues if elected after June 30th." Seconded by Mr. Van Zwaluwenburg. Carried. Then original motion carried.

Dr. Hagan moved that the Hawaiian Entomological Society appoint Dr. Walter Carter as its delegate to the Fifth International Entomological Congress to be held at Paris in July, 1932. Seconded by R. H. Van Zwaluwenburg and passed. The President then instructed the Secretary to write credentials for Dr. Carter.

NOTES AND EXHIBITION OF LOCAL MATERIAL

Mezium americanum Lap.—Mr. Swezey exhibited specimens of this ptinid beetle which had been handed to him by Dr. H. L. Lyon, March 14, 1932. They were said to have been found among stored seeds at the Vineyard Street Nursery. Specimens had been submitted to Dr. E. C. Van Dyke at the University of California, who replied that they agreed with their *Mezium americanum*. This is the first record of the identity of this beetle in Hawaii, but it had been collected previously by Bridwell in sparrow nests in 1916 (Proc. Haw. Ent. Soc., III, p. 288, 1917), and by Swezey in dried sunflower heads in 1912.

Hyposmocoma alliterata Walsm.—Mr. Swezey exhibited a specimen of this tiny white black-spotted moth bred from larval case on bark of kiawe tree collected at Ewa coral plain, April 13, 1932. The larval cases were quite common on the trees in the region. It is the first time it has been known to occur at such low elevation. It most commonly occurs on the bark of koa trees, as on Mt. Tantalus and similar elevations.

Anagyrus saccharicola Timb.—Mr. Swezey reported that he had recently received Mr. Timberlake's MS.* description of this mealybug parasite. He also reported that it had been found established and widely dispersed in the plantations on the north side of Oahu and also the west side, now making a complete dispersal on Oahu.

Conoderus exsul (Sharp).—Mr. R. H. Van Zwaluwenburg called attention to the general acceptance by most authorities of the generic name Conoderus for the elaterid beetles commonly known as Monocrepidius. These genera were established by Eschscholtz in Thon's Entomologisches Archiv, Vol. 2, part 1, in 1829, Conoderus on page 31 and the other on the following page. The type of Conoderus is defined as having the prothorax long and conical, and the apex of the elytra bispinose; in Monocrepidius the prothorax is wide, and the tips of the elytra are without spines. Perhaps a monographic study of the some 350 species involved would result in both genera being valid, and in the definition of additional genera. From our present knowledge of the species-complex the common immigrant Monocrepidius in Hawaii, with the tips of its elytra often terminating in short but well-defined spines, should be known as *Conoderus exsul* (Sharp).

Cosmophila vulpicolor Meyr.—Dr. Williams mentioned that he had collected a large larva of this noctuid moth that was feeding on the rosaceous plant *Osteomeles anthyllidifolia* Lindl. near Naalehu in the Kau desert of Hawaii, in April, 1932. The caterpillar spun a cocoon and pupated but failed to hatch. Heretofore this insect has been found only on Molokai and Oahu.

Epitritus wheeleri Donisthorpe.—In collecting insects in the old pahoehoe lava area south of Olaa village, Hawaii, in April, 1932, Dr. Williams found several kinds of ants, including a specimen of *Epitritus wheeleri*, a tiny species with long slender mandibles. It was first found here at Waimanalo, Oahu, in June, 1932, by Mr. O. H. Swezey. Also at Olaa, were taken some specimens of a tiny ant new to the islands.† It seems to belong to the genus *Strumigenys*, subgenus *Cephaloxys* F. Smith that has shorter, fine-toothed mandibles than our *Strumigenys lewisi* Cam., but like it

* Published in Proc. Haw. Ent. Soc., VIII, No. 1, p. 159, 1932.
† *Strumigenys membranifera* Emery, var. *williamsi*. Identified by Dr. W. M. Wheeler. See pages 275-276 in this issue.—[Ed.]

is hypogaeic, though in larger colonies. The ants were found under moss on lava stones, under the latter or in the soil at the base of grass. The destructive *Pheidole megacephala* ant was not found in this district.

Anagyrus saccharicola Timb.—Dr. Williams also reported that the Philippine encyrtid parasite of the pink sugar cane mealybug was found established on all five of the sugar plantations on Maui (April, 1932).

Melanoxanthus melanocephalus (Fabr.).—A specimen of this elaterid beetle was taken on the lanai (porch) of the Hilo Hotel, Hilo, Hawaii, in April, 1932, by Dr. Williams. This is the first record of this beetle on the Island of Hawaii.

Stenomicra, apparently *angustata* Coq.—Dr. Williams exhibited a small, rather slender pale yellowish brown fly of the family Geomyzidae, determined by Dr. J. M. Aldrich as *Stenomicra* species apparently *angustata* Coquillet, an insect described from Puerto Rico, in 1900. The genus is monotypic. This agile fly may sometimes be seen in the cane fields of Hawaii, it having the habit of retracing its steps and moving backwards on a leaf, and calls to mind thereby some of the small pale-colored chalcid wasps. The specimen in hand was reared from one of two larvae secured by Mr. O. H. Swezey from the water-filled leaf base of Job's Tears (*Coix lacryma-jobi* Linn.). The larva has a small head and a forked caudal end and is quite flattened (depressed) and moves in an undulating manner, somewhat caterpillar-like, and is aided by prolegs. It is glassy-white except for gut, or glands. On one occasion one of the larvae was seen swallowing large quantities of air which, entering the gut as lengths of silvery cylinders, broke up in bubbles, one behind the other. The larvae were transferred to water in a thick watch glass and supplied with a portion of decayed leaf. They remained more or less submerged, sometimes completely so. From one of these larvae a single adult was produced on February 12, 1932. The larvae never appeared well fed and one of the two was observed as late as February 5, making the larval life a long one.

Mr. Ehrhorn exhibited a number of pupae of the ladybeetle *Chilocorus circumdatus* (Schön.), aligned on a twig.

Dr. Carter exhibited some photographs that showed experimentally-produced pineapple wilt, also "green spotting" by what seemed to be a certain strain or condition of the pineapple mealybug. The anatomy and secretions of these mealybugs were discussed.

NOTES AND EXHIBITION OF FOREIGN MATERIAL

Mr. E. P. Mumford exhibited specimens of three acridids (short-horned grasshoppers) endemic to the Marquesas Islands, together with the following notes. "Endemic Acridids and other Orthoptera of the Marquesas Islands": At the last meeting of the Hawaiian Entomological Society, I exhibited specimens of *Cyphogastra bedoci* Théry, a buprestid endemic to the Marquesas Islands and remarkable for its interesting discontinuous geographical distribution.

I now wish to show specimens of three endemic acridids from the same group of islands. The first of these, a new species of Patanga, was taken for the first time by the Pacific Entomological Survey in large series on the uninhabited island of Eiao, some 54 miles to the northwest of Nukuhiva. This island was visited by the Entomological Survey in September, 1929, and again in April, 1931. It had not hitherto been visited by entomologists.

I also wish to exhibit specimens of *Valanga marquesana* Uvarov which is endemic to the island of Nukuhiva, already mentioned as some 54 miles to the southeast of the island to which the new species of Patanga is restricted.

In addition to the endemic acridids mentioned above, I am showing specimens of the endemic genus and species *Ootua antenuata* Uvarov, which is peculiar to the island of Hivaoa, some 90 miles to the southwest of Nukuhiva.

Though there are no native Acrididae in Hawaii, endemic species occur in Samoa.

Two interesting features of the Marquesan acridids (as far as they are at present known) are the restriction of each species to a single island and the presence of as many as three genera. The presence of the endemic genus Ootua is noteworthy.

In addition to the above, the Survey has made collections of an endemic tetrigid of the genus Hydrotetrix. The Marquesan species appear to be morphologically distinct from the Tahitian;

they have similar aquatic habits, frequenting wet rocks on the banks of mountain streams and swimming strongly under water. No species of the family has been described from the Marquesas hitherto. The presence of this genus both in the Marquesas and Society Islands and its absence from the Hawaiian Islands is significant.

Of the two species of Gryllidae, one is widespread in Oceania, and the other is probably distributed by commerce. The Tettigoniidae, represented in Hawaii by endemic species of Banza, are in the Marquesas represented by some remarkable endemic conocephalids. Unlike Hawaii, there are in the Marquesas a number of endemic blattids.

The Phasmidae are represented by a species of stick-insect, *Graeffea crouanii* (Le Guillou), which feeds on the leaves of the coconut.

There are thus only two families of Orthoptera apparently totally unrepresented in the Marquesas, i.e., the Mantidae and Grylloblattidae.

BOOK REVIEWS

Mr. E. H. Bryan, Jr. gave a brief commendatory review of two books, i.e., "Classification of Insects," by C. T. Brues and A. L. Melander, and "Hunting Insects in the South Seas," by Evelyn Cheesman.

JUNE 2, 1932

The 317th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on June 2, 1932, at 2:30 p.m.

The following members were present: Adamson, Bianchi, Bryan, Ehrhorn, Hagan, Illingworth, Ito, Keck, Mason, Mitchell, Mumford, Phillips, Rosa, Schmidt, Swezey and Van Zwaluwenburg.

Visitor: Mr. Solander.

In the absence of the President, Vice-President Hagan called the meeting to order, and requested Mr. Van Zwaluwenburg to act as Secretary in the absence of Dr. Williams.

Mr. Bryan's comments on Miss Cheesman's book, "Hunting

Insects in the South Seas," led to a discussion by Messrs. Swezey, Adamson and Bryan of native names for insects. Native insect names both here and in other Pacific islands are comparatively few and are seldom specific. In contrast to this there are a great many native names for plants, birds, fish and other more or less conspicuous objects of natural history.

NOTES AND EXHIBITION OF LOCAL MATERIAL

Cremastus hymeniae Vier.—Mr. Rosa exhibited specimens of this ichneumonid reared from *Bactra truculenta* Meyr. (a previously unrecorded host) on Maui. Two specimens of this wasp were reared from cocoons found in dying nutgrass stems, at Lahaina, Maui, on April 23, 1932.

Rhizobius ventralis (Erich.).—Mr. Rosa reported finding a larva of this coccinellid feeding on *Spodoptera mauritia* eggs collected in a cane field at Hana, Maui. The larva was quite small when found and thrived on *mauritia* eggs, finally maturing on May 4, 1932. This is a new record of food habit.

Hister bimaculatus Linn.—Mr. Van Zwaluwenburg reported collecting a specimen of this uncommon beetle on the Schofield Golf Club grounds, May 18, 1932. Mr. Swezey had also found another beetle of this species in a lot of old grass brought in by Dr. Williams from the same locality.

**Cephalonomia peregrina* Westw.—Mr. Swezey reported the recovery of this bethylid at his home in Manoa Valley, May 22, 1932, where it had bred on *Catorama mexicana* Chevr. He secured 7 females and a batch of cocoons from Catorama-infested tomato seeds. This parasite had been liberated there in September, 1930, and it evidently became established. The original ones had come from India in May, 1930, having been found in a cardboard infested with a ptinid that came in a mail package. Several generations were reared and liberated in buildings at the H.S.P.A. in 1930. This is the first recovery.

Empoasca solana De Long.—Mr. Swezey stated that he had recently received this identification by Mr. F. W. Poos of Arlington Farm, Va., for the little green jassid occurring on amaranths and several other weeds and plants.

* Identification furnished by Dr. Marshall. See page 238 in this issue.

Anagyrus sacchariсola Timb.—Mr. Swezey reported having collected mealybugs from a field at Oahu Sugar Company, and finding 20 per cent parasitized by this Philippine Anagyrus. From a field at Waianae, 10 per cent were parasitized.

Pseudococcus kraunhiae (Kuwana).—Mr. Swezey reported having found Ipomoea pods infested with this mealybug at Mapulehu, Molokai, April 4, 1932. From these mealybugs he had reared two parasites: *Pauridia peregrina* Timb. and *Leptomastidea abnormis* (Gir.). This is the first record of the latter on Molokai.

Coccotrypes dactyliperda (Fab.).—Mr. Swezey reported finding one of these scolytid beetles in seed of the cabbage palm on May 11, at the Vineyard Street Nursery. It was the first time that he had found it in seeds of this palm.

Lagocheirus obsoletus Thoms.—A specimen of this cerambycid beetle was exhibited by Mr. Swezey, which was collected May 11 in a pupal cell in a log of *Araucaria brazilensis* at the Vineyard Street Nursery, Honolulu. A pupa and several larvae were also found, and numerous exit holes from which the beetles had issued. The larvae fed in the inner bark, then when full-grown each gnawed a circle nearly through the outer bark, before burrowing into the wood to make its pupal cell, lying lengthwise and about ½ inch inside the wood. The circle formed a lid from 1 to 1¼ inches in diameter, which apparently in most cases broke away before the adult beetle was ready to issue. This is a much larger opening through the bark than is necessary to allow the adult beetle to issue, for it is usually about ¼ inch wide, and usually the provision that the larva of cerambycid beetles makes for the exit of the adult through the bark is to gnaw a hole almost through the bark, and merely of sufficient diameter to allow the exit of the beetle.

Pycnoderes 4-maculatus Guer.—Dr. Illingworth found this species infesting squash vines at Kaimuki, May 30, 1932. This species was first reported by him January 2, 1930 (Proc. Haw. Ent. Soc., VII, p. 466) feeding upon purslane.

Engytatus geniculatus Reuter.—Dr. Illingworth found these bugs on squash vines at Kaimuki. The leaves of the plants were

drying up from the effects of a disease showing as a mildew-like growth on the under surface. These bugs have frequently been reported as a pest of tomatoes in the Islands, but none of these plants was growing in the vicinity of the infested squash plants. Squash disease resulting in wilt of the leaves affected was exhibited by Dr. Illingworth. The young leaves showed an abundant population of a green jassid. Spots of mildew soon appeared, followed quickly by drying of the leaf at the edges. In a few days the whole leaf is dry and dead. Other insects found on the plants were *Pycnoderes 4-maculatus* Guer. It is a question, however, whether the insects have any relation to the failure of the plants.

Latrodectus mactans (Fab.).—Mr. Ehrhorn showed an unhatched egg-case of the black widow spider. Both he and Dr. Illingworth commented on the highly cannibalistic habits of this spider.

Rhodesiella elegantula Becker.—Mr. Bryan exhibited a vial of flies handed him by Mr. Keck, which had been caught at Moanalua, Oahu, by Mr. K. H. Lau, May 23, 1932, where they were caught in Mediterranean fruit-fly traps containing a rice bait, in great numbers. The species seems to be *Rhodesiella elegantula* Becker, a hitherto rare fly.

**Agrilus extraneus* Fisher.—The capture of this buprestid by Mr. Bianchi on a blossom of *Argemone glauca* L. at Waipahu, Oahu, in May, was reported. Comparison with specimens in the Bishop Museum shows it to be identical with the specimens recorded by Sharp in the Fauna Hawaiiensis (Vol. 3, p. 400). According to Sharp at that time (1908) the insect was a recent immigrant to Oahu.

Scelio pembertoni Timb.—Mr. Swezey reported the first field recovery of this egg-parasite of *Oxya chinensis* (Thun.). Grasshopper eggs exposed by Mr. Lex Brodie at the Manoa arboretum subsequently yielded two specimens of this scelionid, which was introduced by Mr. Pemberton from the Federated Malay States in 1931.

Erebus odora L.—Mr. Swezey reported that Dr. Williams wrote from Hilo, Hawaii, of finding large numbers of larvae of

* Described on page 249 of this issue. [Ed.]

this species clustered on *Cassia nodosa* Ham. Mr. Swezey suggested that one reason the larvae are so seldom seen is that they may feed nocturnally on the foliage of their various leguminous hosts.

Cephennodes hawaiicus Blattny.—Mr. Van Zwaluwenburg reported that Mr. L. L. Buchanan of the U. S. National Museum writes that the minute scydmaenid beetle found in soil on Tantalus, Oahu, has been given the above manuscript name by Dr. Blattny of Czechoslovakia.

Bufo marinus.—The introduction of the giant West Indian toad from Porto Rico by Mr. Pemberton in April, 1932, was placed on record. Four shipments totalling 148 live toads on arrival were received; these were released at the Manoa Substation (68 specimens) and in a taro patch adjoining the Waipio Substation (80 specimens). This toad was introduced into Porto Rico in 1920 and 1921 from Barbados and Jamaica, and is reported to have increased there to enormous numbers. It is a general insect feeder, being particularly addicted to scarabaeid adults.

EXHIBITION OF FOREIGN MATERIAL

Mr. Adamson exhibited a photograph of a minute Marquesan lathridiid beetle superficially resembling Proterhinus, which Dr. E. C. Van Dyke has described as a new genus, Mumfordea. Two species were taken in the Marquesas by the Pacific Entomological Survey.

JULY 5, 1932

The 318th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station, H.S.P.A., on July 5, 1932, at 2:30 p.m.

The following members were present: Messrs. Adamson, Bianchi, Bryan, Chock, Chapman, Ehrhorn, Mumford, Pemberton, Phillips, Rosa, Schmidt, Smith, Van Zwaluwenburg, Watt and Williams.

Visitor: Miss Suehiro.

President Chapman called the meeting to order.

The minutes of the preceding meeting were read and approved.

Annoying house mites, presumably from birds' nests, was brought up for discussion by Dr. Chapman, Mr. Pemberton and others participating.

Tromatobia rufopectus (Cresson).—Specimens of this ichneumonid were exhibited by Mr. Rosa. He had collected them in a cane field of the H.S.P.A. Substation at Kailua, Oahu, June 14, 1932. They were issuing from an egg sac of the spider *Argiope avara* Thorell. The larvae feed on the spider eggs, later pupating in the sac. These specimens were identified by Dr. F. X. Williams. This is a new immigrant in Hawaii.

Mr. Bryan exhibited specimens of the following species of flies from the Hawaiian Islands, which had recently been determined for him by Dr. J. M. Aldrich of the U. S. National Museum:

Borborus bilineatus Grimshaw, an endemic species (family Borboridae) from Kahoolawe Id., February 19, 1931, one near the house and one swept from salt bush.

Hecamede albicans Meigen, first record of an immigrant European species (family Ephydridae), swept from salt bush, Kahoolawe, February 14, 1931.

Gymnopa sp., 3 specimens from Kahoolawe, swept from salt bush, February 14, 1931.

Psychoda albipuncta Williston, which Edwards (The Entomologist, 61, p. 32, 1928) places in the genus Telmatoscopus. This large, gray, hairy psychodid is now becoming fairly abundant about water holes, and occasionally coming into houses, where it frequents sinks, washbowls, and windows.

Euplectrus platyhypenae Ashm.—Mr. Bryan exhibited a series of this parasite which were bred from a caterpillar on yellow Coreopsis in his garden in Manoa. The caterpillar was covered with the characteristic hairy fuzz, in which the parasites pupate. Fifty-seven wasps emerged.

**Strumigenys* sp.—Dr. Williams spoke of an ant taken by himself near Olaa, Hawaii, in April and recently identified by Dr.

* *Strumigenys* (*Cephaloxys*) *membranifera* var. *williamsi*. See page 276 of this issue. [Ed.]

W. M. Wheeler of Harvard University as *Strumigenys* of the subgenus *Cephaloxys,* with the remark: "Possibly it is an old, indigenous, relict form."

Anagyrus saccharicola Timb.—Dr. Williams reported the recovery of the Philippine Anagyrus wasp, parasitic on the pink sugar cane mealybug, in Field 33, Honomu Sugar Company, Hawaii, on June 9, 1932.

Scelio pembertoni Timb.—Mr. Pemberton spoke of the recovery, for the second time, of the Scelio wasp, parasitic on Oxya grasshopper eggs, at Waimanalo, early in June of this year. Oxya eggs were placed in the field and brought into the laboratory, where, in due time, Scelio wasps were disclosed. Scelio wasps had been liberated at Waimanalo a considerable time previous. He also exhibited some Porto Rican sugar cane pests and their parasite and spoke of the rapid spread of the cottony-cushion scale on that island and the introduction from Florida of *Vedalia cardinalis,* its ladybeetle enemy.

AUGUST 4, 1932

The 319th regular meeting of the Hawaiian Entomological Society was held August 4, 1932, at the H.S.P.A. Experiment Station, Honolulu, T. H., at 2:30 p.m.

Members present: Messrs. Adamson, Bianchi, Bryan, Chock, Ehrhorn, Illingworth, Keck, Mason, Pemberton, Schmidt, Smith, Swezey, Van Zwaluwenburg and Williams.

Visitors present: Mrs. E. M. Blackman, Mrs. M. E. Washburn, and Mr. Solander.

The President and Vice-President being absent, the Secretary-Treasurer suggested that someone be appointed chairman for the meeting. It was moved and seconded that Mr. E. M. Ehrhorn be so appointed. Mr. Ehrhorn accepted the chair and called the meeting to order.

The minutes of the preceding meeting were read and approved as corrected.

Publication Committee.—Mr. O. H. Swezey reported that the Hawaiian Sugar Planters' Association had assured its financial aid

towards publishing the Proceedings of the Hawaiian Entomological Society, VIII, No. 1, and the work is now well under way.

Mr. C. E. Pemberton reviewed a paper entitled: "Entomological Researches in the Marquesas Islands," by E. P. Mumford and A. M. Adamson, that was presented at the Entomological Meeting in Paris this summer. It brought forth much favorable comment and the hope that the survey be continued to completion.

Mr. E. H. Bryan, Jr., stated that Dr. L. Berland, of the Natural History Museum at Paris, who was undertaking a comprehensive publication on Zoogeography, wrote asking for papers on the Hawaiian insect fauna. After some discussion the chairman suggested that the secretary write to Dr. Berland referring him to the principal entomological works dealing with the Hawaiian insect fauna.

The chairman, Mr. E. M. Ehrhorn, stated that he had received a letter of greeting from Dr. L. O. Howard in Paris.

Mr. A. M. Adamson spoke of the use of cellophane envelopes for Odonata, an innovation of Dr. Needham's.

PAPER

Mr. O. H. Swezey presented a paper entitled, **"New Insect Records on Molokai and Miscellaneous Notes."**

LOCAL NOTES AND EXHIBITS

Adenoneura parapteryx Meyrick.—Mr. Swezey brought to attention that the tortricid described under this name by Meyrick in Exotic Microlepidoptera, IV, Pt. 7, p. 222, 1932, is the same as we have been calling *A. falsifalcellum* Walsm. This latter name has been used for it in the Proceedings of the Hawaiian Entomological Society, Vol. II, pp. 93, 142; Vol. VII, p. 281.

Hermetia illucens (Linn.).—Dr. Williams exhibited specimens of a large stratiomyid fly, identified as the widespread tropical and sub-tropical American *Hermetia illucens* (Linné) and found also in Samoa. It was noted as an adult insect in 1930, in upper cane fields of Hilo Sugar Company, but not recognized then as something new. During July, 1932, however, a number of individuals were bred from filter-press mud obtained in a mauka field of Hilo Sugar Company, Hawaii. The insect is common in the West Indies where it has also been found to breed in filter-press mud by Van Zwaluwenburg and Wolcott. It is a new immigrant in Hawaii.

Phygadeuon sp.—Specimens of this ichenumonid wasp, apparently a species of *Phygadeuon*, found in the same locality and at the same time as *Hermetia illucens*, were caught chiefly on the filter-press mud wherein also the syrphid flies *Volucella obesa* (Fabr.) and *Lathryopthalmus arvorum* (Fabr.) were breeding. The wasp is parasitic in the puparium of Lathryopthalmus; a rather weak cocoon of silk enclosing the pupa of the hymenopter being found in one puparium. Some of the European Phygadeuonides are parasites of Syrphidae. It is a new immigrant in Hawaii.

Mr. Q. Chock exhibited a handsome araneid spider which he had taken on its web at Pearl City.

Pseudococcus longispinus (Targ.).—Mr. C. Schmidt stated that he found this mealybug on pineapple crowns on the Island of Lanai, most of the adult mealybugs being parasitized by the Chalcid wasp *Anagyrus nigricornis* Timb. This is a new record for Lanai. He further stated that *Hellula undalis* (Fabr.), the imported cabbage webworm, did a great deal of damage to the daikon seedlings in open greenhouses at the Pineapple Experiment Station in Honolulu.

SEPTEMBER 1, 1933

The 320th regular monthly meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association on September 1, 1932, at 2:40 p.m.

Members present: Messrs. Adamson, Bianchi, Bryan, Ehrhorn, Pemberton, Rosa, Schmidt, Smith, Swezey, Van Zwaluwenburg and Williams.

Visitor: Mr. E. L. Caum.

In the absence of both President and Vice-President, Mr. O. H. Swezey was selected chairman for the meeting. Mr. Swezey took the chair.

The minutes of the preceding meeting were read and approved.

The Secretary then read a communication delivered to him some time ago; a letter from Dr. F. G. Krauss, Director of Extension work in agriculture, University of Hawaii, to Dr. R. N. Chapman, President of the Hawaiian Entomological Society. The letter had reference to guarding against the potato tuber moth (*Phthorimaea operculella*) in Hawaii. Following a discussion on

this pest, already well established in Hawaii, a motion was made by Mr. E. H. Bryan, Jr., seconded by Mr. E. M. Ehrhorn, and passed by vote, that the Secretary be instructed to communicate with Dr. Krauss, informing him that the potato tuber moth is already established in Hawaii, and that while the Hawaiian Entomological Society would be glad to advise on control measures, it feels that this problem more fittingly belongs to the entomological department of the Territorial Board of Agriculture and Forestry, or to that of the University itself.

PAPER

"Insects from Kaula Island"

BY E. H. BRYAN, JR.

Specimens were exhibited and Mr. E. L. Caum gave interesting observations on his trip to Kaula Island, showing a number of photographs of this rugged and desolate islet, a sea-bird rookery. Skink lizards were also present. The vegetation was low and scant.

NOTES AND EXHIBITIONS

Mr. F. Bianchi exhibited a spider that he had found in the basement of the H.S.P.A. Experiment Station.

Tinea pellionella L.—Mr. Swezey reported this moth as a host for *Protapanteles hawaiiensis* Ashm. From 14 larval cases found among fibrous litter beneath insect cabinets, 4 of the braconids had already issued, as evidenced by their empty white cocoons inside the cases of the host. This equalled 28% parasitism.

Plagithmysus perkinsi Shp.—Mr. Swezey exhibited a specimen of this longicorn beetle, which had recently matured from a larva found boring in Myoporum at Nauhi, Hawaii, 6,000 feet elevation, September 29, 1931.

Plagithmysus concolor Shp.—A specimen of this longicorn beetle was exhibited by Mr. Swezey, who had reared it from a larva collected under bark of a fallen lehua tree at Halemanu, Kauai, July 6, 1932. The beetle matured August 23. This is the first record of the rearing of this beetle, but it has been collected previously on lehua by Osborn in 1919, and on Ohia ha by Perkins.

Trigoniulus lumbricinus (Gerst.).—Dr. Williams stated that he and Mr. Van Zwaluwenburg, while examining old cane stubble in Field 60, just above Aiea, Honolulu Plantation Company, August 4, 1932, discovered several specimens of this large millipede. This seems to be a new locality record, and its farthest distribution from Honolulu.

OCTOBER 6, 1932

The 321st regular monthly meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association on October 6, 1932, at 2:30 p.m.

Members present: Messrs. Bryan, Chapman, Chock, Ehrhorn, Illingworth, Ito, Keck, Mason, McBride, Mitchell, Pemberton, Phillips, Rosa, Smith, Swezey, Van Zwaluwenburg, Weinrich and Williams.

Visitors: Mr. G. Solander and Dr. W. D. Funkhauser.

President Chapman called the meeting to order. The minutes of the preceding meeting were read and approved.

PHOTOGRAPH COMMITTEE

Mr. Bryan presented the Society with a photograph of the late Dr. N. A. Cobb, an early member of the Society.

PAPERS—LOCAL SUBJECTS

On behalf of Mr. F. Bianchi, Mr. Swezey presented a paper by W. S. Fisher, of the Bureau of Entomology, entitled: **"A New Species of Agrilus from the Hawaiian Islands."**

Coconut weevils from Samoa.—Mr. Swezey exhibited specimens of two weevils recently taken by Mr. Whitney in quarantine inspection, on coconuts received from Samoa, August 11. One was determined as *Aphanocorynes humeralis* Marshall, by comparing with specimens from Samoa, at the Bishop Museum. The other was found to be the same as a *Pentarthrum-like weevil that has been known in Oahu since 1908, but unidentified. This weevil was first collected on sugar cane (beneath leaf sheaths) at Waialua in 1908; at Ewa Plantation in 1912 and 1932; at Waipio, on bark of algaroba tree, in 1919. Apparently it is of no importance as it remains rare.

* Later identified by Dr. Marshall from Oahu specimens as *Stenotrupis filum* Fairm. from Tahiti. [Ed.]

Aspidiotus lataniae Sign.—Mr. Swezey reported that Mr. Whitney had identified as this species a scale insect infesting gladiolus corms handed in by Dr. Forrest Brown. Apparently it is the first record of it infesting gladiolus in Hawaii. It usually infests palms.

Contarinia maculipennis Felt.—Mr. Swezey reported that Dr. Williams had found the hibiscus bud-midge affecting the flowers of his Tantalus white hibiscus growing at Woodlawn, Manoa Valley, Sept. 5. The petals were somewhat crumpled by the injury of the midge larvae while still in bud. The injured buds did not fall off as has heretofore been noticed with other hibiscus buds when attacked by the midge larvae. The flower opened normally except that those petals which happened to have been injured were somewhat crumpled.

Rhynchephestia rhabdotis Hamps.—Mr. Swezey exhibited this phycitid moth and called to attention that its description had been published in Ann. Mag. Nat. His. (10), V, p. 52, 1930. This is the moth whose larvae feed in the flower heads and in the stems of the silversword (*Argyroxiphium sandwicense* var. *macrocephalum*) in Haleakala Crater, Maui.

Tromatobia rufopectus (Cress.).—Mr. Swezey reported having reared nine females and two males of this ichneumonid from an egg cocoon of *Argiope avara* Thor. collected in Makua Valley, Sept. 27, 1932. From the eggs of the mass that were not eaten, 360 spiders hatched Oct. 8. The 11 parasites issued from their cocoons Oct. 10. Mr. Swezey reported also having caught a specimen of this parasite at Gunsight Pass in the Waianae Mts., Sept. 11, 1932. It was in the vicinity of a web of a large spider different from *Argiope avara,* probably a species of Epeira. No egg cocoons were found.

Toxomerus marginatus (Say).—Mr. Swezey exhibited this small syrphid fly which he had caught at Kokee, Kauai, June 14, 1932. It is the first record of it in the Hawaiian Islands. It is a common species in the United States, where it has been recorded as a predator on aphids. It was quite common at Kokee, but its habits were not observed, except that the adults were about flowers of California daisy and English plantain.

Antonina indica Green *on Sugar Cane.*—The finding of this coccid (identified by Mr. Swezey) on Lahaina cane, among the aërial roots just above ground, was reported by Mr. Van Zwaluwenburg. Two plants among 30 grown outdoors on isolated tables at the Alexander Street plot (Honolulu) for about six months, harbored the insect, mature females of which were present. Manienie (Bermuda) grass and a few species of Paspalum are commonly hosts of *A. indica,* but the previous finding of the species on sugar cane does not appear to have been published. Dr. Williams has recently found an Antonina on aërial roots of sugar cane in the germinating house at Mapulehu, Molokai, on September 25, 1931.

Reduviolus capsiformis (Germ.).—Mr. Bryan exhibited a specimen of this bug (Nabidae) which had been caught by Mrs. Bryan on the lawn of their home in Manoa. Another specimen of what is thought to have been the same species was found sucking blood from the baby, having raised three small welts on his neck.

Pyralis mauritialis Boisd.—Mr. Bryan exhibited for Miss Suehiro: 35 or more of this moth which had issued from a nest of *Polistes hebraeus* (Fabr.) at Bishop Museum during August and September. Wasp's nest was collected by K. O. Moe.

Chloridea obsoleta (Fabr.).—Dr. Williams reported taking a young caterpillar of the corn ear worm in a head of sudan grass at Mapulehu, Molokai, on September 26, 1932.

Scymnus pictus Gorh.—Mr. Chock reported the recovery at Kunia, Oahu, on August 23 of this year, of the neotropical cecidomyid fly* and the coccinellid (*Scymnus pictus*) which are enemies of the pineapple mealybug, introduced from Mexico in 1930.

NOTES—FOREIGN SUBJECTS

Mr. Swezey presented the following recent determinations of Indian insects, by Dr. Marshall:

Zeugenia glutae Mshl. n. sp.—A weevil taken in quarantine inspection in Honolulu in seeds of *Gluta travancorica* from India, December 3, 1929. Dr. Marshall found it to be a new species, the description of which will be published shortly.**

---

* *Lobodiplosis pseudococci* Felt. Journ., New York Ent. Soc., XLI, p. 87, 1933. [Ed.]
** Marshall. Stylops, I, pt. 10, p. 212, 1932. [Ed.]

Gastrallus laticollis Pic.—An anobiid found in cardboard used in packing in a package from India, May, 1930.

Cephalonomia peregrina Westw.—A bethylid found parasitizing larvae of the preceding beetle. Several generations of this parasite were bred in Honolulu on various species of Anobiidae, and some liberations made. After about a year a recovery was made, indicating that it has become established. (Det. by Dr. Ferrière.)

NOVEMBER 3, 1932

The 322nd regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association on November 3, 1932, at 2:30 p.m.

Eighteen members were present.

President Chapman called the meeting to order.

The minutes of the preceding meeting were read and approved as corrected.

The President read the obituary notice of Dr. B. W. Evermann, Director of the Museum of the California Academy of Sciences and of the Steinhart Aquarium. Dr. Evermann, an ardent naturalist, was acquainted with many of us in Hawaii.

Mr. G. Solander was elected to junior membership.

The Secretary read some correspondence re the potato tuber moth in Hawaii.

LOCAL PAPERS

Mr. C. E. Pemberton read a paper entitled **"Delayed Incubation Among Eggs of Oxya chinensis** (Thun.)."

LOCAL EXHIBITS OF MATERIAL

Mr. E. M. Ehrhorn recorded the following species at 3,500-ft. elevation on Maui:

Scolia manilae Ashm.

Polistes fuscatus var. *aurifer* Sauss. with stylops (*Xenos auriferae* Pierce).

Pseudococcus adonidum on Myoporum sp. attended by ants.

Pheidole megacephala and *Tetramorium* sp. (?)

Carpophilus humeralis—pineapple beetle.
Haplothrips usitatus, blossoms.

Stenommatus musae Marshall.—This small weevil was exhibited by Mr. Swezey, who had collected several specimens in rotting banana corms in his garden in Manoa, September 24, 1932. This is the first record of his finding this weevil since the original discovery in banana corms in Kaimuki, February 19, 1920. Dr. Marshall described it at that time as a new species. Later he recorded it from bananas from S. Africa, imported from Java, which he considered its home.

New Elaterid records from the Tuamotus.—Mr. R. H. Van Zwaluwenburg exhibited specimens of *Simodactylus cinnamomeus* (Boisd.) and *Conoderus pallipes* (Esch.), collected on the island of Makatea, Tuamotu Archipelago, in September by Dr. Gerrit P. Wilder. Although the two species are widely spread in the Pacific, Makatea is a new locality record for each. For *C. pallipes* this westernmost island of the Tuamotus thus far marks the eastern limit of its known range.

Oligotoma texana (Mel.).—Mr. Bryan called attention to an article by Harlow B. Mills in the Annals of the Entomological Society of America, Vol. XXV, No. 3, September, 1932, pages 648-652, on the life history and thoracic development of *Oligotoma texana* (Mel.) (Embiidina), in which the author suggests that the external appearance of the wing pads of male embiids takes place during more than one instar, thus substantiating the somewhat discredited observations of Dr. R. C. L. Perkins, made in Entomologist's Monthly Magazine, 1897, pp. 56-58, for *Oligotoma insularis* McLach.

Chalybion caeruleum (Linn.).—Dr. Williams reported seeing at close quarters a female of the steel-blue, mud-daubing wasp (*Chalybion caeruleum* (Linn.), a recent immigrant, a single specimen of which was taken in Honolulu on June 8, 1931, and specimens of what seemed to be the same species observed flying about a fence at Ewa Plantation Company, in March, 1932.

Mr. Bryan stated that several papers of the Pacific Entomological Survey had just been published by the Bishop Museum.

DECEMBER 1, 1932

The 323rd regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association, on December 1, 1932, at 2:30 p.m.

Members present: Messrs. Bryan, Chapman, Hadden, Hong, Illingworth, Ito, Keck, Marlowe, Mason, McBride, Mitchell, Pemberton, Riley, Rosa, Schmidt, Smith, Solander, Swezey, Van Zwaluwenburg, Whitney, and Williams.

Visitors: Miss Suehiro and W. Y. Whang

President Chapman called the meeting to order. The Secretary then read the minutes of the preceding meeting. Approved as read. Announcement was made of the resignations from the Society of Mr. J. T. Watt and Dr. H. Hagan. It was moved by Mr. Pemberton and seconded by Mr. Hadden that these two resignations be accepted with regrets by the Society, through the Secretary-Treasurer.

Election of officers for 1933 resulted as follows:

President: C. E. Pemberton
Vice-President: O. C. McBride
Secretary-Treasurer: F. X. Williams

Additional members of Executive Committee:
E. M. Ehrhorn and O. H. Swezey.

The Treasurer presented the financial report of the Society for the period beginning December 3, 1931, and ending December 1, 1932. It was accepted subject to auditing, and the President appointed Mr. O. H. Swezey a committee of one to audit this account.

Presidential address: **"The Causes of Fluctuations in Populations of Insects,"** by Dr. R. N. Chapman. This interesting paper brought forth much discussion.

PAPERS ON LOCAL SUBJECTS

"New Hawaiian Lepidoptera," by O. H. Swezey.

"Notes on Tromatobia rufopectus in Hawaii," by O. H. Swezey.

"Introduction to Hawaii of Malayan Parasites (Scelionidae) of the Chinese grasshopper Oxya chinensis (Thun.), **with Life History Notes,"** by C. E. Pemberton.

"New Hawaiian Coleoptera, with Notes on Some Previously Known Species," by Dr. R. C. L. Perkins (presented by title by O. H. Swezey).

EXHIBITION AND DISCUSSION OF LOCAL MATERIAL

Isodontia harrisi Fernald.—Mr. Swezey reported having observed a female of this wasp with a nymph of *Conocephalus saltator* (Sauss.) which she was apparently carrying to her nest or burrow. The occurrence was by the roadside along a cane field near the mouth of the valley leading from Sacred Falls, November 11, 1932.

Spheterista tetraplasandra (Sw.).—Mr. Swezey exhibited a series of 6 females of this tortricid moth reared from caterpillars collected by him on leaves of Tetraplasandra on the ridge leading up to Puu Kaua, Waianae Mts., Oahu, November 6, 1932. The species was described as a Capua by Swezey (Proc. Haw. Ent. Soc., IV, p. 385, 1920) from 2 male specimens bred from fruits of Tetraplasandra at Wailupe and Kaumuahona, Oahu, respectively. Examination of the types and the more recent specimens shows that the species goes to the genus Spheterista erected by Meyrick to contain *Capua variabilis* Walsm. and *C. pleonectes* Walsm., and possibly some other Hawaiian species. Meyrick described *S. asaphopis* in Proc. Haw. Ent. Soc. VII, p. 96, 1928. *S. pleonectes* and *S. asaphopis* were both reared from caterpillars on leaves of Cheirodendron.

Ceratitis capitata Wied.—Mr. Swezey reported finding fruitfly maggots in breadfruit, November 21, 1932, from which the flies issued later. This appears to be the first record of the Mediterranean fruitfly breeding in breadfruit.

Acythopeus gilvonotatus Barber.—Mr. Swezey reported that he had recently identified as this species of weevil a specimen collected by Dr. Lyon in orchid greenhouse, Honolulu, April 24, 1916. Barber's description is in Proc. Ent. Soc. Wash., XIX, p. 17, pl. 4, figs. 3, 3A, 1917.

Leucostoma aterrima Villers.—Mr. Swezey exhibited specimens of this tachinid fly which had recently been determined by Dr. Aldrich, and now recorded for the first time under this name in

the Hawaiian Islands. The specimens had been taken for *atra* Towns., which had been identified in 1921 by Dr. Aldrich. (Recorded in Proc. Haw. Ent. Soc., V, p. 30, 1922.) In a recent letter Dr. Aldrich points out the following differences: "The males are easily separated because in *aterrima* the last two segments of the abdomen are pollinose, while in *atra* they are highly shining like the remainder of the fly. The females of *aterrima* have an elongated, slender abdomen, while in *atra* it is of the ordinary form; in both it is entirely black. Another difference, more tangible, is that in *atra* the female has a pair of erect bristles on each side of the first three segments near the hind margin, while in *aterrima* the last segment has only depressed bristles, not an erect pair."

Dr. Aldrich states that the *Leucostoma analis* Meigen? recorded in the Fauna Hawaiiensis, III, p. 20, 1901, is a synonym of *aterrima.*

The specimens recently examined and determined by Dr. Aldrich are as follows:

Leucostoma aterrima—1, Koloa, Kauai, 1908 (Swezey); 1, Ewa Coral Plain, Oahu, 1920 (Williams); 1, Puuloa, Oahu, ex *Corizus hyalinus,* 1920 (Swezey); 1, Kaimuki, Oahu, 1921 (Swezey); 2, Waianae, Oahu, 1930 (Swezey).

Leucostoma atra—1, Honolulu, Oahu, 1920 (Williams).

Pycnoderes 4-maculatus Guerin.—Specimens of the mirid bug *Pycnoderes 4-maculatus* Guerin were exhibited by C. E. Pemberton. He found adults fairly common on garden beans at the residence of A. M. McKeever, Lihue, Kauai. This is the first record of its occurrence on that island. It was first seen in Hawaii on December 11, 1929, by Dr. J. F. Illingworth, who collected it on purslane in Honolulu.

Hypoderma lineata De Villiers.—Mr. Pemberton reported observing with Mr. Swezey the larvae of the ox bot fly (determined by Swezey) in the hides of freshly slaughtered steers from the Kukaiau Ranch, Hawaii. Some of the hides examined had a half dozen or more small holes along the back made by the larvae. Since these cattle were born and reared at Kukaiau, they had become infested at this locality, which indicates that the fly is established in Hawaii. Former recoveries of these larvae in the Terri-

tory have been made only in cattle brought from the mainland and presumably infested there.

Scelio pembertoni Timb.—Mr. Pemberton reported the recovery of *Scelio pembertoni* Timb. from Waimanalo Plantation on June 2, 1932, and again from the same locality during November, 1932. It was also recovered from Waianae Plantation during November, 1932, and a second time during November, 1932, from Upper Manoa Valley. These recoveries were all made by exposing unparasitized *Oxya chinensis* eggs in each locality for from 3 to 7 days and then bringing them to the laboratory and holding in vials for parasite emergence. At each point where parasites were recovered, liberations had been made from 3 months to a year previously with material bred in the laboratory from parasites introduced from the Federated Malay States during 1930-31.

Vespa occidentalis Cresson.—Mr. Pemberton reported having collected a specimen of *Vespa occidentalis* Cresson from a cane leaf at Lihue Plantation, Kauai, November 22, 1932. This is a new locality for it on Kauai. It has not been found on the other islands of the group and has been previously known only in the mountainous portion of western Kauai since January, 1919 (A. Kusche), and at Kilauea Plantation on the north side of the island since September 29, 1930 (F. X. Williams).

Mapsidius auspicata Walsm.—A series of specimens of this moth was exhibited by Mr. McBride that had reared from larvae and pupae brought in from the Hawaii National Park, Kilauea, Hawaii, where they were feeding very abundantly on the foliage of Charpentiera trees. This moth was originally collected by Perkins on Kauai and Lanai. It has been reared by Swezey on Oahu where it is common on Charpentiera. It has not been recorded previously from the island of Hawaii.

Brachistella lutea (Fullaway).—The rearing of this trichogrammid from the eggs of the jassid *Draeculacephala mollipes* (Say), collected in sugar cane leaf at Olowalu, Maui, in November, making a new island record for this parasite, was reported by R. H. Van Zwaluwenburg. The identification was made by Mr. Swezey.

Pheidole megacephala (Fabr.).—Dr. Illingworth stated that there appears to be a lack of evidence of mating flights of this

species of ants. Just after daylight of the morning of November 15, following a heavy rain in the night, the air at Kaimuki was filled with flying insects, extending to great heights. Some of these were captured and they proved to be queens of this species. No males were in evidence. Apparently the flight was nearly over when discovered, the insects settling rapidly to the ground. After about a quarter of an hour none was in evidence. They had scattered widely, and upon alighting quickly sought shelter, crawling beneath rubbish or into cracks in the soil, etc. During the past 20 years several flights of the males of this ant have been observed by Dr. Illingworth. These occurred in the late evening, the insects coming to lights. The indications are that these flights take place during darkness, which would explain the scarcity of observations on this subject.

Taeniothrips gladioli M. & S.—Dr. Chapman mentioned the recent discovery of the presence of this gladiolus pest in Honolulu. Mr. Chock, who was not present, had found gladiolus very severely injured by this thrips at florist gardens in Nuuanu Valley, November 17. It was afterward found in other localities in Honolulu, and Mr. Chock had found it established already on the islands of Maui and Hawaii. Specimens had been submitted by Mr. Whitney to Mr. Steinweden in San Francisco for verification of its identity.

Insects from Kaula Island

BY E. H. BRYAN, JR.

(Presented at the meeting of Sept. 1, 1932)

Mr. Edward L. Caum collected a few specimens of insects on Kaula Island, which lies about 20 miles southwest of Niihau, August 18, 1932. The island is the remains of an ash or tuff cone, about a mile from one extremity of the crescent-shaped ridge to the other, and rising precipitously to a height of about 600 feet, from an extensive submarine platform. (See Palmer, B. P. Bishop Museum Bulletin 35, 1927.)

No insects have been previously reported from Kaula, the Tanager Expedition having been unable to land in 1923. The present list contains fifteen species, most of which are immigrants, widespread throughout the Hawaiian group.

HYMENOPTERA

Holepyris hawaiiensis (Ashmead), 1 specimen (Det. by O. H. Swezey).

Eupelmus sp., 1 male and therefore not to be determined (O. H. Swezey).

Prenolepis longicornis Latr., 4 specimens on flowering Euphorbia.

Monomorium floricola Jerdan, numerous specimens on all the plants, especially the Euphorbia and Sida, which were in flower.

DIPTERA

Scenopinus fenestralis (Linn.), 2 specimens, found inside Sida blossoms.

Sarcophaga barbata Thomson, 1 specimen, the only one seen.

Lucilia sericata (Meigen), 11 specimens, "common everywhere, especially swarming on the flowers of Euphorbia."

Siphunculina signata (Woll.), 1 specimen, found in Sida blossom.

COLEOPTERA

Coelophora inaequalis (Fabr.), 1 specimen, the only one seen.

Scymnus kinbergi Boh., 1 specimen on Euphorbia.

LEPIDOPTERA

Petrochroa sp. 1 specimen, too much abraded for determination, but possibly identical with an undescribed species from Oahu, or with *P. neckerensis.* (O. H. Swezey.)

HOMOPTERA

Delphacid, 1 small nymph, probably on Sida blossoms.

THYSANOPTERA

Haplothrips usitatus (Bagn.), 4 specimens (Det. by O. H. Swezey.)

EMBIIDINA

Oligotoma insularis McLachlan, 2 specimens in the thin mat of roots and soil under plants.

CHELONETHIDA

Pseudoscorpions, 4 specimens in soil under plants.

A Hibiscus Bud Midge New to Hawaii

BY E. P. FELT

Bartlett Tree Research Laboratories, Stamford, Connecticut

An excellent series of midges was received from Mr. O. H. Swezey, Entomologist, Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu, under date of January 8, 1932, and accompanied by the statement that they had been recently reared from buds of hibiscus in Honolulu. The species is reported to be new in that section of the world, and had been found in only two places in Honolulu at the date of writing. The larvae of this species cause the buds to fall off before the flowers open.

Contarinia maculipennis n. sp.

Male. Length .75 mm. Antennae nearly twice the length of the body, thickly haired, yellowish brown; 14 segments, the fifth with stems each with a length two and a half times their diameters; terminal segment having the basal portion of the stem with a length four times its diameter, the distal enlargement pyriform and with an apical, finger-like process having a length approximately three times its diameter. Palpi: the first segment subquadrate, the second with a length over twice its width, the third with a length three times its width and the fourth one-half longer than the third. Mesonotum, reddish brown, the submedian lines fuscous yellowish. Scutellum, yellowish brown; postscutellum fuscous yellowish. Abdomen a variable dark yellowish brown. Wings subhyaline, variably fuscous, especially along the veins. Halteres mostly pale yellowish, brownish subapically. Legs: coxae and femora pale yellowish; tibiae yellowish, fuscous apically; tarsi mostly dark brown, an indistinct subapical band on the second segment and most of the third, fourth and fifth segments yellowish on the posterior legs. Genitalia: dorsal plate broad, deeply and narrowly emarginate, the lobes angularly rounded.

Female. Length, 1 mm. Antennae about three-fourths the length of the body, sparsely haired, yellowish brown; 14 segments, the fifth with a stem about one-third the length of the cylindrical basal enlargement, the latter with a length about two and a half times its diameter; terminal segment produced, the basal portion with a length four times its diameter and apically with a short broad process, the latter with a length about twice its diameter. Palpi: first segment subquadrate, the second with a length over three times its diameter, the third as long as the second, the fourth one-half longer than the third. Mesonotum, reddish brown, the submedian lines yellowish. Scutellum, yellowish brown, postscutellum, fuscous yellowish. Abdomen a variable fuscous yellowish. Ovipositor, yellowish, one-half

longer than the body, the terminal lobes slender with a length about six times the width. Wings distinctly subhyaline and more highly colored than in the male. Legs: coxae and femora mostly pale yellowish, with tarsi yellowish brown except a broad subapical band on the second segment and the third, fourth and fifth segments which are yellowish on the posterior legs.

Types deposited in the United States National Museum (No. 43940). Cotypes in the collections of the Hawaiian Entomological Society, and of the Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu.

A New Species of Agrilus from the Hawaiian Islands (Coleoptera: Buprestidae)

BY W. S. FISHER

Associate Entomologist, Bureau of Entomology, United States Department of Agriculture

Agrilus extraneus n. sp.

Agrilus sp. Sharp, Fauna Hawaiiensis, vol. 3, part 5, 1908, p. 400.

Male. Moderately elongate, vaguely flattened above, and rather strongly shining; head bright green, becoming cupreous on the occiput; pronotum and elytra olivaceous green, with a distinct aeneous and cupreous tinge in certain lights; beneath aeneous green, with the tarsi blackish.

Head with the front wide, feebly convex, about equal in width at top and bottom, the lateral margins feebly, arcuately expanded at vertex, and with a feeble, longitudinal groove on vertex and occiput; surface densely, finely granulose and irregularly, transversely rugose on the front, becoming longitudinally rugose on the occiput, with a few moderately coarse punctures between the rugae, and sparsely clothed, especially behind the epistoma, with moderately long, semierect, silvery white hairs; epistoma transverse between the antennae, and broadly, feebly, arcuately emarginate in front; antenna extending to middle of pronotum, serrate from the fourth joint, and the outer joints wider than long; eyes large, broadly oval, and equally rounded above and beneath.

Pronotum one-half wider than long, narrower at base than at apex, and widest at apical fourth; sides feebly rounded from apical angles to middle, then obliquely narrowed to the posterior angles, which are rectangular; when viewed from the side the marginal and submarginal carinae are feebly sinuate, widely separated anteriorly, and connected to each other at basal third; anterior margin strongly sinuate, with a broadly rounded median lobe; base deeply emarginate at middle of each elytron, with the median lobe freely, broadly rounded, and subtruncate or feebly emarginate in front of scutellum; disk moderately convex, broadly, vaguely depressed on each side along lateral margin, and with the prehumeral carinae only feebly indicated; surface rather finely, densely, transversely rugose, sparsely, finely punctate between the rugae, and sparsely clothed at the sides with short, recumbent, whitish hairs. Scutellum transversely carinate, and the surface finely, densely reticulate.

Elytra slightly wider than pronotum at base, and about equal in width at base and behind middle; sides parallel for a short distance behind base, broadly, arcuately constricted near middle, broadly, arcuately expanded behind middle, then obliquely narrowed to the tips, which are separately, narrowly rounded, and finely serrulate; sides of abdomen broadly exposed above; disk moderately convex, and with broad, moderately deep, basal depressions; surface finely, densely imbricate-punctate, and rather densely, uniformly clothed with short, recumbent, white hairs.

Abdomen beneath rather sparsely, finely punctate, and sparsely, uniformly clothed with recumbent, white hairs; vertical portions of segments slightly more densely pubescent than ventral surface; first and second

segments convex, and clothed with long, erect, white hairs at the middle; pygidium not distinctly carinate at middle. Prosternum finely, densely punctate or rugose, and rather densely clothed with long, white hairs, which are recumbent at the sides, erect at the middle, and extending along the median part of the body to the second abdominal segment; prosternal lobe broad, strongly declivous, and broadly rounded or subtruncate in front; prosternal process rather broad, the sides nearly parallel to behind the coxal cavities, then obliquely narrowed to the apex, which is acutely rounded. Posterior coxae with the posterior margin transversely truncate or feebly sinuate, and the exterior angle rectangular and not prolonged. Tibiae slender, and the anterior and middle pairs armed with a short tooth on the inner margin at apices. Posterior tarsus about one-half as long as tibia, and the first joint as long as the following two joints united. Tarsal claws dissimilar (claws on posterior feet missing); claws on anterior feet cleft near the tip, the teeth acute, and nearly equal in length; claws on middle feet cleft near middle, the inner tooth broad, much shorter than the outer one, and not turned inward. Length, 4.75 mm.; width, 1.4 mm.

Female. Unknown.

Type locality.—Honolulu, Oahu, Hawaiian Islands.

Other locality.—Waipahu, Oahu.

Type.—Bishop Museum.

Paratypes.—In the United States National Museum, Washington, and in the collection at the Experiment Station of the Hawaiian Sugar Planters' Association.

Described from three males, the type and one paratype collected at the type locality by R. C. L. Perkins (Perkins No. 757), and one paratype collected at Waipahu, Oahu, May, 1932, feeding on the pollen of *Argemone glauca,* by F. A. Bianchi. The three specimens were sent to me for identification by Mr. Bianchi; two of these specimens are from the Bishop Museum, and are the specimens referred to by Sharp * as having been recently introduced into Oahu. Without any doubt this is an introduced species, as no species of Buprestidae have been recorded as indigenous to the Hawaiian Islands.

This is one of the obscure forms of this large genus, and resembles *Agrilus davaoensis* Fisher from the Philippine Islands. It differs, however, from that species in having the pubescence on the elytra more uniformly distributed, the prosternum without distinct depressions or prehumeral carinae, the prosternal process parallel to behind the coxal cavities, and the prosternum and first two abdominal segments clothed at the middle with long, erect, white hairs.

* Fauna Hawaiiensis, vol. 3, part 5, 1908, p. 400.

Delayed Incubation Period Among Eggs of Oxya chinensis (Thun.) (Orthoptera)

BY C. E. PEMBERTON

(Presented at the meeting of November 3, 1932)

Hibernation in the egg stage in Acrididae of temperate zones is generally assumed to be caused primarily by low winter temperatures. This tendency is so marked that with some species eggs laid in the autumn and held indoors at warm temperatures undergo the same retarded development prevailing under outdoor conditions. However, with some tropical or semitropical species it has been shown that hibernation in the egg stage may be induced by drought in regions having long dry periods at more or less regular intervals.

In view of the above it is of interest to give some cases of delayed incubation in the eggs of the Chinese grasshopper *Oxya chinensis* (Thun.) where neither low temperatures nor drought were operative during the entire period of incubation.

In the course of breeding the egg parasites *Scelio serdangensis* Timb. and *S. pembertoni* Timb. of this grasshopper in Malaya during 1930 and in Honolulu in 1931, thousands of Oxya eggs were held in glass tubes for many months. In order to secure exact life cycle data on the parasites, the various lots of Oxya egg pods were kept segregated and the emergence of both parasites and hoppers tabulated. The greater proportion of unparasitized eggs produced hoppers in about 6 weeks both in Malaya and Honolulu. Swezey * originally records the incubation period in Hawaii as 6 weeks. This may be taken as the normal duration of the egg stage. The following exceptions to the average of approximately 42 days, obtained in the handling of many thousands of eggs, which were kept constantly over wet cotton in glass containers at normal Honolulu and Malayan temperatures, represent extremes in our data, and though of rare occurrence, have been of sufficient frequency in both localities to be recorded as a definite life habit for this species.

* Hawaiian Planters' Record, vol. XXX, no. 3, p. 381, July, 1926.

AT SERDANG, FEDERATED MALAY STATES

Eggs deposited	Eggs hatched	No. hatching	No. days
Sept. 18, 1930	Jan. 11, 1931	11	114
Sept. 18, 1930	Jan. 16, 1931	6	119
Oct. 1, 1930	Feb. 25, 1931	13	147
Oct. 1, 1930	Feb. 26, 1931	14	148
Oct. 1, 1930	Feb. 27, 1931	3	149
Oct. 1, 1930	Feb. 28, 1931	7	150
Oct. 1, 1930	Mar. 1, 1931	1	151
Nov. 18, 1930	Mar. 31, 1931	1	132
Nov. 23, 1930	Mar. 30, 1931	1	126

AT HONOLULU, HAWAII

Eggs deposited	Eggs hatched	No. hatching	No. days
Aug. 1, 1931	Nov. 18, 1931	2	108
Sept. 2, 1931	Jan. 9, 1932	16	128
Sept. 2, 1931	Jan. 12, 1932	3	131
Sept. 2, 1931	Jan. 17, 1932	1	136
Sept. 21, 1931	June 26, 1932	1	277
Sept. 24, 1931	Jan. 22, 1932	8	119
Sept. 24, 1931	Jan. 24, 1932	5	121
Oct. 9, 1931	Jan. 6, 1932	17	88
Oct. 9, 1931	Jan. 11, 1932	13	93
Oct. 11, 1931	June 9, 1932	10	240

Introduction to Hawaii of Malayan Parasites (Scelionidae) of the Chinese Grasshopper Oxya chinensis (Thun.) with Life History Notes

BY C. E. PEMBERTON

(Presented at the meeting of Dec. 1, 1932)

DISCOVERY AND IMPORTATION

The immigrant grasshopper *Oxya chinensis* (Thun.) has been known in Hawaii for at least 35 years. Its spread and the increased notice of its damage to sugar cane since 1925 led the writer to undertake a study in 1930-31 of natural enemies which might attack it in the Federated Malay States. Seven species of Oxya, including *O. chinensis* have been recorded from Malacca and the Malay Peninsula.[1] Egg parasites of grasshoppers of this genus have been noted in India [2] and the assumption that parasites also occurred in the Malay Peninsula proved correct after six weeks of study.

At Serdang, in the State of Selangor, F. M. S., adult *Oxya chinensis* grasshoppers were confined in field cages resting directly on the ground and covered with large mesh wire screen. Eggs were thus obtained in the soil beneath these cages under field conditions and parasites, if present, could readily pass through the screen to reach the eggs. The egg pods were periodically removed from the soil and held in glass tubes for observation. From the first three lots of egg masses so obtained, two new species of scelionid parasites emerged in sufficient quantity for laboratory breeding operations to start immediately. These parasites *Scelio serdangensis* Timb. and *Scelio pembertoni* Timb. have since been described by P. H. Timberlake.[3]

Between December, 1930 and April, 1931, thirteen shipments of parasitized Oxya egg pods were made to Honolulu, from which about 2600 parasites, representing both species, were reared and many liberated in various parts of the Hawaiian Islands. Further breeding and liberation has continued to date (November, 1932) in Hawaii with a total distribution mostly to sugar plantations of

about 37,000 parasites. This has resulted in the known establishment of *Scelio pembertoni* in several localities where attempts to recover the parasites have been made.

Early in the breeding work in Honolulu, the species *Scelio serdangensis* gradually died out and in a few months only the one species *S. pembertoni* remained. The bulk of the liberations have hence been of the latter.

Figures 1 to 8 inclusive are given to furnish a ready means of distinguishing the two species.

LIFE HISTORY AND HABITS

The following are taken from notes and breeding data on the biology of *Scelio pembertoni*:

Oviposition:

The parasite deposits its eggs directly within those of the grasshopper. The eggs of the latter are laid slightly underground in masses of about 15 to 25, cemented and enclosed together in a white, frothy secretion which quickly hardens to a porous, brown, corky consistency forming what is commonly termed an egg pod (Figures 14 and 15). Such pods are reached by the parasite without apparent difficulty by penetration through the soil space left open over the pod when the grasshopper withdraws the tip of its body after egg deposition. Should soil fall in and completely cover the egg pod, the parasite can evidently force its small body between the loosely packed particles with ease. In laboratory breeding it was found that Scelio females would force their way through ¼ to ½ inch of coarse sand to reach Oxya egg pods so covered. As the body is compact, hard and only from 3.1 to 4.25 mm. long, no fossorial structures are present or required for the shallow penetration of soil necessary to locate Oxya eggs.

Upon reaching the grasshopper egg pod the Scelio female immediately applies the tip of the ovipositor and usually assumes the position indicated in Figure 15. Sometimes she eats a hole into the egg pod. Occasionally this may be as deep as the length of her body. When such a hole is prepared she then backs into it and commences prodding the egg pod in search of eggs in which to oviposit. The ovipositor may be described as a flexible, tubular

process 9 mm. in length and completely telescoped within the abdomen. It is clearly chitinized only for 2 mm. at the distal end. This portion consists of the two piercing blades or stylets and the stylet sheath, the tips of which are shown in Figure 9. Each stylet (Figure 9A) bears a group of about 10 well-formed, compactly placed barbs or lateral expansions about 1 mm. from the tip, as shown in the figure. It is probable that these structures, which extend backwards, facilitate oviposition by holding the ovipositor at least 1 mm. into the Oxya egg once it has been pierced and thus enabling the delicate egg of the parasite to pass well into the host egg before the guiding blades of the ovipositor are removed. The stylet sheath (Figure 9B) is not barbed. It no doubt functions as a piercing blade also since it is even more delicate and sharply pointed than the stylets.

During oviposition the ovipositor is slowly extruded and forced into the porous, corky egg pod in search of an egg. The body of the parasite, with the exception of the ovipositor parts, remains almost entirely motionless. This may last a half hour or longer. In case distant eggs in the pod are sought the ovipositor becomes extended over twice the length of the body. A close correlation exists between the size of Oxya egg pods and the greatest extension possible for the Scelio ovipositor. The longest axis of 82 egg pods deposited in moist sand and of normal shape and size was found to average 9.3 mm. and as above stated the ovipositor is capable of extension to a distance of 9 mm.

The withdrawal of the ovipositor after having been fully extended into a grasshopper egg pod is always accomplished slowly and only after much strenuous exertion. Occasionally a female may fail to ensheathe or telescope the ovipositor tube back into the abdomen after oviposition. In such cases the long, glistening, pale yellow tube remains permanently protruding and in such a state the parasite is incapable of further egg laying; but may otherwise feed and appear perfectly normal in spite of the encumbrance.

Oviposition, once started, may last for several hours without interruption. Females have been observed to oviposit or at least attempt oviposition in the same egg pod for 3 to 5 hours continuously without once withdrawing the ovipositor and with little if any change of position during the entire period. Apparently all

eggs in an egg pod may be reached by the ovipositor in such cases. Usually less than a half hour elapses before the ovipositor is withdrawn completely.

More than one Scelio egg may be placed in an Oxya egg and all hatch, but only a single parasite develops.

Parasitized Oxya eggs exhibit minute brownish spots where the Scelio ovipositor has been inserted.

Age of Oxya Eggs Parasitized:

Contrary to our expectations, Oxya eggs in all stages of development may be successfully parasitized. Vinokurov [4] has observed a Scelio in eastern Siberia which parasitizes certain grasshopper eggs only at the time the grasshopper is placing its eggs in the soil and at no other time. In the early stages of our breeding work with *Scelio pembertoni* and *S. serdangensis,* only Oxya eggs freshly laid or from 2 to 3 days old were used. These were readily parasitized. Later observations with the former species indicated that older eggs may be easily parasitized also. On November 17, 1931, fifty-three unparasitized Oxya egg pods, 14 days old, were exposed to 30 female *Scelio pembertoni* for 24 hours. From these pods parasites began emerging on December 26 and continued emerging almost daily until January 24, 1932, totaling 286 individuals.

A final experiment, using the same species, indicated that mature Oxya eggs, almost ready to hatch, may also be successfully parasitized. On November 19, 1932, twelve Oxya egg pods, 30 days old, were placed on sand in a jar containing 40 Scelio about half of which were females. These were left with the parasites for three days and then isolated in a vial for emergence records. The 12 egg pods contained a total of 196 Oxya eggs. In a few days 132 grasshopper nymphs emerged from eggs unsuccessfully parasitized and on December 27-28 a total of 64 parasites hatched from the balance of the eggs.

A small percentage of *Oxya chinensis* eggs may incubate for from 2 to 7 months longer than their normal period of about 6 weeks. Later observations have shown that *Scelio pembertoni* may successfully parasitize these old, retarded dormant embryos also.

Period of Oviposition:

Oviposition usually begins almost immediately after the emergence of the female. Egg tubes dissected from freshly hatched individuals are always found to contain many mature eggs. Should the parasite fail to locate Oxya egg pods for at least two weeks after emerging it may still successfully accomplish parasitism. Twelve females and a number of males which emerged on December 24, 1930, were held in a test tube for 14 days and fed only honey and water. At the end of this period they were exposed to 8 unparasitized Oxya egg pods for 2 days. Subsequently from these pods 77 parasites were reared. Egg laying usually occurs daily for from 8 to 14 days. Mortality naturally comes sooner with ovipositing females than with those having no opportunity to lay. They seldom live more than 2 weeks when ovipositing daily. Dissection of the egg tubes from such females at the time of death always show few, if any, well-developed eggs remaining.

Number of Eggs Deposited:

A few records have been obtained on the number of progeny of individual females. Eight freshly emerged females were confined in individual jars with several males on December 30, 1930, and daily given fresh *Oxya chinensis* egg pods until all females had died. Each pod was then saved in a separate vial to obtain the emergence record. This experiment continued until January 21, 1931, when the last female died. No progeny were obtained from females after the twelfth day. Most of the eggs were deposited at irregular intervals during the first 8 to 10 days. The following table shows the total number of progeny per female and the daily rate of oviposition. Perhaps in some cases more than one egg would be placed in a single Oxya egg. In such cases the progeny result is always one instead of two or more.

TABLE I

NUMBER OF PROGENY AND DAILY RATE OF OVIPOSITION OF 8 FEMALES (*Scelio pembertoni*)

Date of Oviposition	Number of Progeny							
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Dec. 30, 1930	....	8	6	....	12	1	....	9
Dec. 31, 1930	2	....	....	....	....	8	2	....
Jan. 1, 1931	12	10	3	....	....	6	....	6
Jan. 2, 1931	1	....	10	....	....	....	....	2
Jan. 3, 1931	2	6	....	19	....	....	....	....
Jan. 4, 1931	1	13	....	....	16	....	1	....
Jan. 5, 1931	....	3	....	....	....	....	....	....
Jan. 6, 1931	....	11	2	10	....	9	....	....
Jan. 7, 1931	....	....	....	....	....	....	3	....
Jan. 8, 1931	7	....	....	1	....	....	4	....
Jan. 9, 1931	5	....	....	1	....	9	....	....
Jan. 10, 1931	....	3	....	....	....	....	....	....
Total	30	54	21	31	28	33	10	17

From Table I it is seen that the greatest number of progeny obtained from a single female was 54. It is probable that under the most favorable conditions in the field this number may be greater, for from 50 to 75 fairly mature eggs can usually be dissected from the ovaries of freshly emerged females.

Parthenogenesis and Proportion of Sexes:

Normal oviposition is accomplished by unmated females. In several tests made, their progeny were always males. This is probably of considerable importance in the continued maintenance of the species, for the proportion of the sexes in field collected material has shown a preponderance of females over males. Parasitized egg pods have been under observation from which nothing but females emerged. The males usually remain over the egg pod after emerging to await the hatching of females, with which they mate immediately. Normally a well-parasitized egg pod will nearly always produce more females than males. During indoor breeding

work in Honolulu in January, 1932, an examination of 481 parasites gave 281 females and 200 males. From egg pods exposed to parasites in field recovery work in Manoa Valley, Honolulu during November, 1932, a total of 121 parasites emerging gave 97 females and only 24 males.

The Egg:

The newly deposited egg is .8 mm. long, broadly oval and terminating at the caudal end in a long slightly curved stalk as shown in Figure 10. The cephalic end is narrowed to a slight tubercle. The entire egg is placed completely within the Oxya egg. The duration of the egg stage was not accurately determined but Oxya eggs parasitized 5 days previously were found to contain Scelio larvae of the first instar.

The Larva:

The newly hatched larva (Figures 11 and 12) is most remarkable and unusual in shape and structure. Apart from the absence of legs, it bears superficially a strong resemblance to members of the collembolid genus Sminthurus. A larva of the scelionid genus Teleas quite similar was described by Ayres[5] in 1884. Packard [6] and Imms [7] consider such larvae to be the result of premature embryonic development which in most other insects would have been passed before the hatching of the egg. Similar first instar scelionid larvae have been described by Balduf,[8] McColloch and Yuasa [9] and Martin [10].

No respiratory or nervous organization is discernible, the digestive tract is blind and no body segmentation is exhibited. It is characterized by well-developed antennal processes and large weakly chitinized mandibles. The abdominal portion of the body bears about 16 strong bristles arising dorso-laterally and an elongate tapering tail-like appendage extending forward beneath the body almost to the head. The function of such processes was not determined, though they probably facilitate locomotion.

The later larval stages of Scelio were not seen.

Emergence of Adult:

Scelio adults emerge from the Oxya egg pods by chewing their way out through the corky substance enclosing the eggs. The exit

hole (Figure 14) is usually circular and barely large enough to permit the parasite to escape. An egg pod from which 15 to 20 parasites have emerged usually shows only a few exit holes. Compact, spherical egg pods sometimes have but one exit hole, through which as many as 18 parasites escaped. In general, a parasitized egg mass will nearly always have much fewer emergence holes than the number of parasites it produced.

Emergence mostly occurs between the hours of 9 A.M. and 4 P.M. and less commonly thereafter until sunset.

Longevity:

In laboratory experiments, adults seldom live much over three weeks when fed honey and water and permitted to oviposit. As already mentioned, such individuals usually die in about two weeks. When kept in subdued light and given only water they usually live for about 12 days and rarely over 15 days. Without food or water mortality usually occurs within one week.

Life Cycle:

Life cycle data on 2,755 individuals taken at Serdang and Kuala Lumpur, Selangor, F. M. S., between October 10, 1930, and April 20, 1931, indicated an average period from egg to adult of from 25 to 35 days; the shorter cycle occurring during the warmer weather. These records were mostly obtained with the species *Scelio pembertoni,* though some included *S. serdangensis.* No discernible difference was detected between the cycles of the two species. In the course of breeding the former species in Honolulu, life cycle records on 9,391 individuals have been tabulated during 1931-32. During the warmest weather the period may be as short as 25 to 26 days. During December, January and February, the shortest period from egg to adult is usually from 38 to 40 days.

In every month of the year there is considerable variation in the cycle in any given lot of parasitized egg pods. Any lot of Oxya eggs parasitized on a given date begin producing parasites from 25 to 38 days later, depending upon the season of the year and continue yielding parasites for from 10 to 25 days longer. Table II gives a typical case to illustrate the duration and variability of the life cycle of *Scelio pembertoni.*

TABLE II

Life Cycle of *Scelio pembertoni*

Oxya Eggs Parasitized	Parasites Emerged	No. Parasites	No. Days
Oct. 8, 1931	Nov. 4, 1931	35	27
Oct. 8, 1931	Nov. 5, 1931	180	28
Oct. 8, 1931	Nov. 6, 1931	132	29
Oct. 8, 1931	Nov. 7, 1931	14	30
Oct. 8, 1931	Nov. 8, 1931	12	31
Oct. 8, 1931	Nov. 9, 1931	1	32
Oct. 8, 1931	Nov. 12, 1931	4	35
Oct. 8, 1931	Nov. 13, 1931	5	36
Oct. 8, 1931	Nov. 14, 1931	7	37
Oct. 8, 1931	Nov. 15, 1931	19	38
Oct. 8, 1931	Nov. 16, 1931	13	39
Oct. 8, 1931	Nov. 17, 1931	5	40
Oct. 8, 1931	Nov. 18, 1931	4	41
Oct. 8, 1931	Nov. 19, 1931	2	42
Oct. 8, 1931	Nov. 20, 1931	11	43
Oct. 8, 1931	Nov. 21, 1931	4	44
Oct. 8, 1931	Nov. 22, 1931	2	45
Oct. 8, 1931	Nov. 25, 1931	2	48
Oct. 8, 1931	Nov. 29, 1931	1	52

LITERATURE CITED

(1) Willemse, C. 1925. Revision der Gattung Oxya Serville. Tijdschr. Ent. Vol. LXVIII, pp. 1-60, 65 figs.

(2) Ramachandra, Rao Y. 1921. Oxya velox. Rept. Proc. 4th Ent. Meeting, Pusa, 1921. pp. 41-42.

(3) Timberlake, P. H. 1932. Three New Parasitic Hymenoptera from the Indo-Malayan Region. Proc. Haw. Ent. Soc. Vol. VIII, pp. 153-158.

(4) Vinokurov, G. M. 1927. Grasshoppers and Areas of their Outbreaks in Eastern Siberia. Bull. Irkutsk Plant Prot. Sta. Vol. I, pp. 3-52.

(5) Ayres, H. 1884. On the Development of Oecanthus niveus and its Parasite Teleas. Mem. Boston Soc. Nat. Hist., Vol. III, pp. 225-281, 8 pls.

(6) Packard, A. S. 1898. A Textbook of Entomology. pp. 703-704.

(7) Imms, A. D. 1924. A General Textbook of Entomology. p. 181.

(8) Balduf, W. V. 1926. *Telenomus cosmopeplae* Gahan, An Egg Parasite of *Cosmopepla bimaculata* Thomas. Jour. Econ. Ent. Dec., 1926, pp. 835-837.

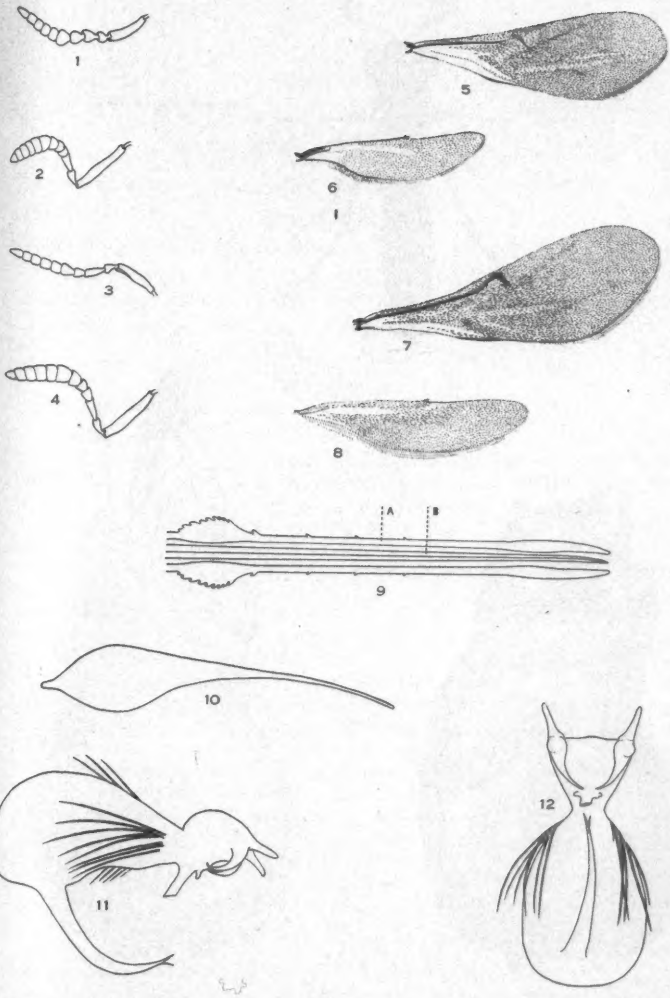
(9) McColloch, J. W., and Yuasa, H. 1915. Further Data on the Life Economy of the Chinch Bug Egg Parasite. Jour. Econ. Ent., Apr., 1915, pp. 250-252, 1 pl.

(10) Martin, C. H. 1927. Biological Studies of Two Hymenopterous Parasites of Aquatic Insect Eggs. Entomologica Americana, Dec., 1927, p. 137, 1 pl.

EXPLANATION OF FIGURES

(All much enlarged)

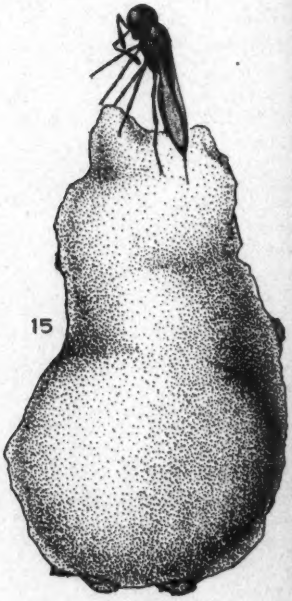
1. Antenna of male *Scelio serdangensis* Timb.
2. Antenna of female *Scelio serdangensis* Timb.
3. Antenna of male *Scelio pembertoni* Timb.
4. Antenna of female *Scelio pembertoni* Timb.
5. Forewing of female *Scelio serdangensis* Timb.
6. Hindwing of female *Scelio serdangensis* Timb.
7. Forewing of female *Scelio pembertoni* Timb.
8. Hindwing of female *Scelio pembertoni* Timb.
9. Distal portion of ovipositor blades of *Scelio pembertoni*. A. Stylet. B. Stylet sheath. Length 1.1 mm.
10. Newly deposited egg of *Scelio pembertoni*.
11. Newly hatched larva of *Scelio pembertoni* (lateral aspect).
12. Newly hatched larva of *Scelio pembertoni* (ventral aspect).
13. Female *Scelio pembertoni* Timb.
14. Egg pod of *Oxya chinensis* (Thun.), from which parasites have emerged.
15. Female *Scelio pembertoni*, showing typical position assumed when ovipositing in Oxya egg pod.



Figures 1, 2, 5, 6: *Scelio serdangensis.* Figures 3, 4, 7-12: *Scelio pembertoni.*

13

14



15

Scelio pembertoni

New Hawaiian Coleoptera, with Notes on Some Previously Known Species

BY DR. R. C. L. PERKINS

Newton Abbot, England

(Presented by title by O. H. Swezey at the meeting of Dec. 1, 1932.)

The eight new species of beetles here described have mostly been sent to me for description by Mr. O. H. Swezey, and amongst them are several extremely interesting forms. The species sent from the Nauhi Gulch on Hawaii seem to be either identical with, or very closely allied to, species found on Haleakala, Maui. Except where otherwise indicated, the types to be deposited in the collection of the Hawaiian Entomological Society.

CERAMBYCIDAE

Plagithmysus sapindi n. sp.

Length (including wings) of two female examples described, 10-12 mm. General color black, elytra, more or less, paler apically, the metasternum apically, the antennae, tibiae more or less, the tarsi, and the base of the femora rufescent or pale, the latter either blackish or obscurely red. Pronotum clothed with short pale pubescence without definite vittae, the elytra with a conspicuous basal patch of pale hairs towards the shoulders and with a subflavescent pubescence along the flattened sutural part from the apex to rather before the middle of their length, these inconspicuous pubescent lines becoming wider anteriorly where there is an irregular patch or some flecks of denser hairs; there are also other variable flecks of denser pubescence scattered about the elytra.

Face rather densely hairy on either side of the median groove. the antennae with sparse outstanding hairs beneath on the basal joints. Pronotum above dull, almost evenly pubescent, the very dense sculpture not hidden, the central elevation or crest broad and not strong, with two distinct carinae posteriorly and sometimes with an anterior one equally distinct, between these scabrous or tuberculate, and there are similar asperities between the median crest and the sublateral elvations, beneath which the sculpture at the sides of the pronotum is less dense and the surface between the punctures shining. Elytra under a strong lens with coarse dense rugose punctures, finer on the posterior half along the sutural portion, and externally to this somewhat shining. The apices are more or less pale, brown or yellow, and in one of the specimens the yellow color extends broadly along the lateral margin nearly to the middle; scutellum rather densely hairy, metepisterna with a dense apical pubescent spot; sides of the abdominal segments, except the basal, densely pubescent, between these lines very sparsely hairy. Hind femora, except the base, black or blackish red,

clothed evenly with white decumbent hairs, widening very gradually from the base to the apex, hind tibiae with obliquely outstanding black hairs, but at the base with white ones, the tarsi densely clothed with snow-white hairs.

Hab.—OAHU, Niu. Bred from *Sapindus oahuensis,* June 17th and early July, 1932 (O. H. Swezey).

Plagithmysus polystictus n. sp.

Length (including wings) of the single male specimen, 15 mm. General appearance that of *P. munroi* Sharp, with similar rough sculpture of the elytra and long subparallel-sided femora and with a row of well-separated flecks on either side of the suture representing the usual pubescent lines, but the mesopleura and metapleura are almost wholly concealed beneath dense yellowish appressed hairs, the pronotal vittae are more distinct and definite, the lateral ones narrow and the sides below them glabrous. This species is easily distinguished from *munroi* by the distinctly punctured, non-pubescent sides of the pronotum, strongly contrasted with the dull black and very densely punctured parts above and the metasternum, though less densely haired posteriorly than in *munroi,* has a large and very dense yellow patch on each side in front. In the *munroi* examined by me there are some sulphur-yellow flecks on the elytra contrasting with the white ones, but in the new species the flecks are practically all white.

Hab.—KAUAI, Kumuwela. Collected from the trunk of a *Cryptocarya mannii* tree, July 7, 1932 (O. H. Swezey).

Neoclytarlus atricolor n. sp.

Length of the single female described, 14 mm. One of the larger species, dull black and very densely finely sculptured over the whole upper surface; the pronotum has no conspicuous or well-defined vittae; the elytra have each a narrow line of white pubescence along the suture from the apex to near the middle of their length, where the lines diverge outwardly to form a furcation, but this is feebly developed and may perhaps sometimes be wanting; the base of the femora is not pale, but at most obscurely reddish.

Head thinly clothed with pale hairs, but more densely on either side of the middle facial groove, the outstanding hairs of the antennae extremely short and sparse. Pronotum gently rounded at the sides, finely and very densely punctured or granulately sculptured, the median elevation or crest broad and the surface scabrous, but without the usual distinct transverse lines or carinae; between the median elevation and the indistinct sublateral ones there is a very feeble linear development of scanty pale hairs, which along the front and hind margins are more developed and connect with the lines which border the lateral ridges; beneath these there is a small smooth area with the sculpture almost obsolete. The scutellum appears to be only sparsely clothed with white hairs and there are a few on either side of the suture a little behind it; there is also a patch at the extreme base of the elytra towards the shoulders, in addition to the furcate lines described above; the sculpture of the elytra is fine and extremely dense all over and apart from the rugulose punctures, except on the apical part, there is much shallow and irregular sulcation of the surface. There is a dense patch of yellowish hair at the apex of the metepisterna and similar dense hair along

the sides of the abdomen, between which the clothing is less dense and whiter. Hind femora clothed with short depressed pale hairs and becoming gradually thickened from the base to near the apex, when they become conspicuously narrowed to the tip, the hind tibiae with short, inconspicuous hairs.

Hab.—HAWAII, Nauhi Gulch, 8500 feet elevation, October 3, 1931; bred from *Vaccinium peleanum* (F. X. Williams).

CURCULIONIDAE, COSSONINI

Oodemas rubicola n. sp.

Length, 3.75-5 mm. Elongate-ovate, rather narrow in form, very bright bronzy metallic, shining, with rufescent antennae, the legs varying from red to nearly black in color; second joint of front tarsi in the male considerably larger than in the female, the lobate third joint large; second joint of the antennae, seen at its longest, about equal to the third, but shorter than this. Head with moderately long rostrum, which is at most very slightly wider in front of the antennae than behind them, and is finely, but generally subrugosely punctured, the eyes depressed or hardly at all convex, the antennae moderately long, the scape about equal to the next four joints in one measured male, and to rather more than five in a female, the two first funicle joints quite elongate, the third much shorter, nearly round, and the following ones nearly equal to it in length, but tending to become wider towards the club. Pronotum with fine or very fine punctures. Elytra with rows of remote and feeble punctures and without definite striation, the interstices with still finer feeble punctures, from which in well-preserved and clean specimens minute pale setae are (under a strong lens) seen to arise and to form more or less distinct rows. The sculpture as in many other species varies somewhat, both as regards the punctures themselves and the minute surface sculpture between them.

This species in its comparatively narrow form approaches *O. graciliforme* Perkins of Kauai, but is more closely allied to the Rubus-frequenting species of Maui, *O. chrysodorum* Perkins. Apart from its rather smaller size and darker color, the rostrum is less evidently widened apically and generally more finely sculptured than that of the latter, while the front tibiae are less robust; nor does it agree with the other allied Maui species which either habitually or occasionally occur on Rubus.

Hab.—HAWAII, Nauhi Gulch, 5000-6000 feet elevation, in dead stems of *Rubus hawaiiensis,* September 28, 1931 (Swezey and Williams). I have examined six examples of this species.

Oodemas viridipenne n. sp.

Length about 5 mm. Oblong ovate, robust, with a brilliant brassy green tint, very shining, the antennae and tarsi rufescent; elytra with rows of

strong, fairly regular punctures, the interstices finely and clearly punctured, the sides moderately rounded from the base and a short distance before the apex, at a point where their width is about equal to that at their basal margin, strongly sinuate inwardly to the rounded tip, so that the apical portion is more strongly and abruptly narrowed than in other species. Rostrum rather finely, subrugosely punctured, not at all widened in front of the antennae, which are slender, the scape not quite so long as the width between their insertion, the first and second joints of the funicle elongate and about equal, the funicle as a whole not stout. Pronotum shining, finely and remotely, but distinctly, punctured. Elytra very strongly shining, the punctures in the series deep and as if placed in shallow wide grooves, the interstices, which are very conspicuously punctured, in some aspects appearing quite convex, as if their surface sloped down from the middle to the row of punctures on either side. The sex of the single specimen is uncertain, the front tarsi having the second joint by no means broad, while the lobes of the third joint are of moderate size. The shape of the elytra which are broad and abruptly narrowed behind and of a brilliant greenish metallic color will distinguish this species from any other on Hawaii.

Hab.—HAWAII, North Kona, 3000-4000 feet, 1902 (Perkins). Type in my collection, to be sent later to the Bernice Pauahi Bishop Museum.

Oodemas corticis Perkins.

As I had expressed some doubt of the occurrence of this species on the Island of Hawaii, Mr. Swezey kindly sent over for my inspection four specimens captured in Nauhi Gulch and determined by himself, quite correctly. These specimens as compared with my series from Maui, Molokai and Lanai are of distinctly larger size and generally more shining. So far as I can judge from the limited number of specimens now available, the Lanai and Molokai examples differ slightly in sculpture from the typical Maui form, and with that from Hawaii may form two distinct races, but large series will be required to show how far the differences are constant, owing to the variability of so many species in this genus.

Hab.—HAWAII, Nauhi Gulch and Keanakolu, 5000-6000 feet, October 2-4, 1931, in standing dead koa trunks (Swezey and Williams). Previously recorded from Maui, Molokai and Lanai.

Oodemas solidum Perkins.

Many years ago, I obtained in North Kona a single specimen of an Oodemas which appears to be a small example of *O. solidum*, a species locally common on Haleakala, Maui. At the time of capture it was overlooked amongst a number of *O. konanum* Per-

kins, though its more brilliantly metallic elytra render it distinct even on superficial inspection.

Hab.—HAWAII, N. Kona, 3000-4000 feet. Previously recorded from Haleakala, Maui.

Oodemas paludicola n. sp.

A species of moderate size, 4-5 mm. long. Nigroaeneous, the antennae and sometimes the tarsi rufescent, ovate, not much shining, but the elytra more or less so. Under a strong lens the minute surface sculpture between the punctures both on the pronotum and the elytra is very distinct, the latter with the interstices conspicuously convex at least towards the sides and on the apical portion, so that most of the series of punctures are placed in well-marked grooves. Rostrum with the sides nearly parallel, the apical part not noticeably widened, more or less rugosely punctured and in some aspects appearing longitudinally carinated basally in the middle. Antennae moderately long and slender, the scape about as long as the width of the rostrum between their insertions, the second joint stouter and generally appearing shorter than the elongate third joint, but in some aspects it is really hardly shorter than the latter, the funicle as a whole not stout, but slightly thickening towards the club. The eyes are hardly at all convex. Pronotum generally dull, owing to the well-developed surface sculpture between the very fine but distinct and almost evenly distributed punctures. Elytra with the serial punctures generally remote from one another and often more or less ill-defined and irregular, but variable in different individuals, the interstices finely and conspicuously but not densely punctured and, in addition to the extremely minute sculpture, more or less traversed by very fine sulci. In lateral view of the insect the interstices to a large extent appear to be strongly raised from the serial punctures so as to be strongly convex or subcarinate. The male has the second joint of the front tarsi rather broader than in the female, but the tarsal characters are not very marked and the lobate third joint is of moderate size.

This species is described from several examples taken in company under moss-covered bark of a dead tree and though their most conspicuous specific character is found in the convex form of the interstices of the elytra, yet one specimen in this same batch is without this character. Otherwise it agrees with its companions so well that I have no doubt it is of the same species.

Hab.—MOLOKAI, in the very wet forest above 4000 feet, February, 1902 (Perkins). Type in my collection, to be sent later to the Bishop Museum.

CURCULIONIDAE, OTIORHYNCHINI

Rhyncogonus welchii n. sp.

The single example described is 18 mm. long. Shining black, the eyes compared with those of most species only feebly convex, the elytra each

with a very dense whitish longitudinal vitta of scaly appressed hairs extending from the base nearly to the apex, the inner margin of this vitta coinciding with the fifth row of punctures from the suture; there is a conspicuous basal patch between this vitta and the suture, while some other spots or flecks are also present and the pseudepipleura are to a considerable extent covered with similar dense appressed clothing. At the sides the elytra are explanate from the shoulders, so that a sharp carina separates off the pseudepipleural portion, their apical part is narrowly produced or subacuminate and bifid at the tip. Rostrum thinly clothed with pale hairs and with a denser tract of stouter ones along the eye-margins, carinated in the middle longitudinally and also on either side along the scrobes up to the eyes, rugosely punctured. Pronotum above thinly clothed, but more densely towards and on the side, rugosely punctured, the surface between the punctures smooth and shining and in parts forming some largish impunctate areas, in the middle posteriorly with an impression. Elytra with a very shining surface, the punctures in the rows bearing each a decumbent seta, smaller than those which form the bands, spots and flecks. Inwardly to the longitudinal vittae the rows of punctures are definite, but outwardly to these they are confused. Abdomen beneath densely punctured, the basal segment largely depressed, the two intermediate and the apical segments more densely, almost evenly pubescent, the last very densely finely punctured. The legs are almost evenly clothed with pale decumbent hairs. Antennae with the first funicle joint notably longer than the second, which is more than twice as long as its greatest width, the third considerably shorter than the second and only about twice as long as wide, the following joints subequal, the basal joint of the club about twice as long as wide and much longer than the last funicle joint.

This beautiful and striking species is allied to some of those on Kauai rather than to those on Oahu. I have great pleasure in naming it after its discoverer, who obtained it while collecting land shells for the Bishop Museum. Mr. Swezey, who submitted the insect to me for description, tells me that the area in which it was found may now be closed to collectors as it is part of a large region included in a U. S. Naval Reservation, and it may not be possible to visit the locality again.

Hab.—OAHU, Waianae Mts., Lualualei, Halona Valley, in the 4th gulch southwest of Pohakea Pass, about 1600 feet elevation, from an unidentified shrub or small tree, September 25, 1932 (d'Alté A. Welch). Type to be deposited in the Bishop Museum.

CIOIDAE

Cis paritii n. sp.

Length about 1.5 mm. Cylindrical, black or castaneous, the antennae, mouth parts, legs and front of pronotum generally rufescent or paler in color, shining and appearing glabrous except under a very strong lens or compound microscope, when each puncture is seen to bear a minute pale seta.

The whole insect is densely punctured above, the male with a well-developed angular prominence on each side in front of the eyes, the ridge forming these being more rounded and less developed in the female. Antennae with the club generally infuscate or darker than the rest, its basal joint not much smaller than the second. The prosternum is distinctly margined at the sides and behind; the lateral margins in strict dorsal aspect appear wider towards the hind angles, where the pronotum is widest, the sides being very slightly convergent forwards from these or nearly parallel and then at the anterior third or fourth of its length it becomes much narrowed. The punctures are dense and the surface generally shining, but one of the specimens examined has the pronotum dull, with the very dense minute sculpture between the punctures quite distinct under a strong lens. The elytra are shining and densely punctured, as a rule distinctly paler in color on the apical part.

This minute species is very different from any other of the Hawaiian series, but on account of its small size, copious puncturation and the facial processes of the male might be compared with *C. porcatus* Sharp. That species, however, has a very different clothing and the basal club-joint of the antennae is much smaller as compared with the second, apart from other differences, and the two are not allied. I first noticed this species on the *hau* trees along the Tantalus road not long after houses were built in that neighborhood and suspected that it might be an introduced species.

Hab.—OAHU, Waimanu, on *hau,* under rotten bark, November 22, 1931 (Swezey). Tantalus, on *hau* trees (*Paritium tiliaceum*) about 30 years ago, when it was also collected by W. M. Giffard with me.

Cis porcatus Sharp.

Five specimens (one of which had become detached from the point and could not be found on arrival) of what I have considered a small narrow form of this variable species, were sent by Mr. Swezey. All the specimens are immature and were collected on *koa* in Palolo, Oahu, February 23, 1932. I have taken exactly similar specimens, sometimes in company with larger and more typical ones, on Oahu and have considered these to be a variety of *porcatus.* In some localities this species is often of a reddish color and it varies a good deal in form, and also in sculpture and clothing. Possibly several races may prove to be distinguishable, when it has been specially collected. It is one of the commonest Hawaiian beetles.

Cis laeticulus Sharp.

A single specimen with red head and thorax and the apical portion of the elytra also red was taken on staghorn fern at Kahauiki, Oahu by Swezey, October 16, 1927. This is not an uncommon variety of this rather variable species. I have found this species frequently on the surface of dead fallen leaves especially of Freycinetia, but it is also obtained from standing trees. It has occurred to me on Molokai, Maui and Hawaii (Kona district) in addition to the localities given in the "Fauna."

Cis dracaenae Perkins.

A specimen which I took from a Pipturus tree near Mt. Tantalus has not the pale suture of the elytra as described in the type. I came across this specimen only recently.

Apterocis subaeneus Perkins.

A series of specimens was obtained from a "bracket fungus" on *Acacia koa* in Nauhi gulch, Hawaii, October 2, 1931, by Swezey and Williams, at an elevation of 5000-6000 feet. These seem to agree with the description of the above species described from Maui, though the slight aeneous tinge of the thorax is not always evident. I obtained similar specimens in North Kona, at 4000 feet, many years ago. They are perhaps on the whole darker in color than those from Nauhi gulch. A single specimen collected at 3000 feet on Haleakala, Maui, has the pronotum entirely testaceous or rufescent except for an anterior median and a pair of posterior sublateral infuscations. The punctures of this part are more distinct and definite, the surface being hardly at all strigose. This may prove to be a distinct species.

Hab.—HAWAII, Nauhi gulch (Swezey and Williams). N. Kona at 4000 feet (Perkins). Previously described on a single specimen from Haleakala, Maui, 5000 feet, where at a lower elevation (3000 feet) an allied form, but probably a distinct species was taken.

New Records of Insects on Molokai, and Miscellaneous Notes

BY O. H. SWEZEY

(Presented at the meeting of September 1, 1932)

Bactra truculenta Meyrick.

The nutgrass moth was taken at light at Kaunakakai, June 6, 1932. It is the first record of its occurrence on Molokai.

Monopis meliorella (Walker).

This tineid was taken at light at Kaunakakai, June 6, 1932, and is the first record of its occurrence on Molokai.

Polynema reduvioli Perkins.

Four of this egg-parasite of Reduviolus were reared from *Chaetochloa verticillata* grass, collected at Kaunakakai, June 6, 1932. No doubt the grass stems contained eggs of *Reduviolus capsiformis* (Germ.), as this bug was observed to be present where the grass was collected. It is the host for this mymarid. The parasite was not previously recorded from Molokai.

Leptomastidea abnormis (Girault).

Three of this parasite were reared from *Pseudococcus kraunhiae* (Kuwana) on seed pods of *Stictocardia campanulata,* at Mapulehu, April 4, 1932. It had not previously been recorded from Molokai. From the same material, two *Pauridia peregrina* Timberlake also issued. Both are parasites on the mealybug.

Marietta graminicola Timberlake.

This parasite issued from *Trionymus insularis* Ehrhorn, collected at Kaunakakai, June 6, 1932. It is considered to be a hyperparasite of mealybug parasites.

Oxacis collaris (Sharp).

This oedemerid beetle was quite common at light at Kaunakakai, Molokai, June 6, 1932. An undetermined species of Ananca was also collected at light at the same time.

Crocidosema lantana Busck.

This tortricid moth was found infesting pods of *Bignonia chrys-*

antha at Kaunakakai, June 6, 1932. *Tecoma stans,* a closely related plant, has been reported with terminal twigs bored by larvae of this moth in Honolulu, several times in recent years.

Chloridea obsoleta (Fab.).

A caterpillar of this moth was found feeding on Euxolus at Mapulehu, June 6, 1932. This is an addition to the numerous host plants of this moth.

Argyroploce illepida (Butler).

Several of this moth issued from fruits of *Sapindus oahuensis* collected on Niu Ridge, June 4, 1932. It is probably a new host record for this moth.

Cosmophila vulpicolor Meyrick.

Two of this moth matured from caterpillars collected on *Osteomeles anthyllidifolia* on Niu Ridge, June 4, 1932.

Plagithmysus cuneatus Sharp.

Several specimens of this beetle matured from larvae collected on *Sapindus oahuensis* on Niu Ridge, June 4, 1932. Two beetles also issued from the same material, which proved to be a new species, as yet unnamed.*

Vanessa atalanta (Linn.).

A ragged specimen of this butterfly was collected on Kumuwela Ridge, Kauai, June 27, 1932. This is the first record of this butterfly on any of the Islands except Hawaii, where it has been known for quite a long while.

Tromatobia rufopectus (Cresson).

Five of this parasite issued from a spider egg-cocoon collected on a leaf of *Dianella odorata* at Kumuwela, Kauai, June 25, 1932. There were five dead pupae remaining in the same egg-cocoon. This is the same parasite reported by Mr. Rosa at a previous meeting as having been reared from an egg-cocoon of *Argiope avara.* The identity of the Kauai spider egg-cocoon is not known, but it was not Argiope.

---

* Described by Perkins on page 265 of this issue. [Ed.]

An Ant New to the Fauna of the Hawaiian Islands

BY WILLIAM MORTON WHEELER

Institute of Biology, Harvard University

Dr. F. X. Williams recently sent me several specimens of a singular, hypogaeic ant which he found during April, 1932, "off the road to Puna, south of Olaa, Hawaii, under moss, etc." It represents a variety of *Strumigenys* (*Cephaloxys*) *membranifera* Emery, which was described in 1869 from a single worker taken at Portici, near Naples by the late Professor Emery's brother (Fig. 1a-c). In 1890 Emery described a second form as subsp. *simillima*, also from a single worker, taken on the island of St. Thomas in the West Indies, and four years later Forel described a var. *santschii* from Kairouan, Tunis. Recently (1931) Dr. Marion R. Smith recorded *simillima* from various localities in the state of Mississippi with the remark: "Undoubtedly this subspecies occurs throughout the Gulf States certainly as far west as the Mississippi River."

Many years ago Dr. F. Silvestri sent me five workers of the typical *membranifera* which he had taken in the type locality, near his laboratory at Portici. I have not seen the Tunisian var. *santschii*. Forel described it as differing in its more opaque ferruginous color (though Santschi describes it as "pale yellow"), in having the head more strongly and more irregularly sculptured, with more sharply rectangular anterior corners and the pronotum as having more accentuated marginate borders. I have not seen topotypic specimens of *simillima*. According to Emery, its head is somewhat more elongate and more narrowed anteriorly than that of the typical *membranifera*, with the median post-clypeal impression, or frontal area larger and more pronounced, the antennal funiculi longer and with the terminal joint scarcely longer than the preceding joints together. These differences are shown in his figures (here reproduced as Figure 1b and d).

Proc. Haw. Ent. Soc., VIII, No. 2, November, 1933.

Compared with the typical *membranifera,* the worker of the Mississippi form, which Dr. Smith and I referred to *simillima,* exhibits the following differences in addition to those mentioned by Emery: the pronotum is distinctly broader, with more pronounced anterior and lateral margination and smoother and more

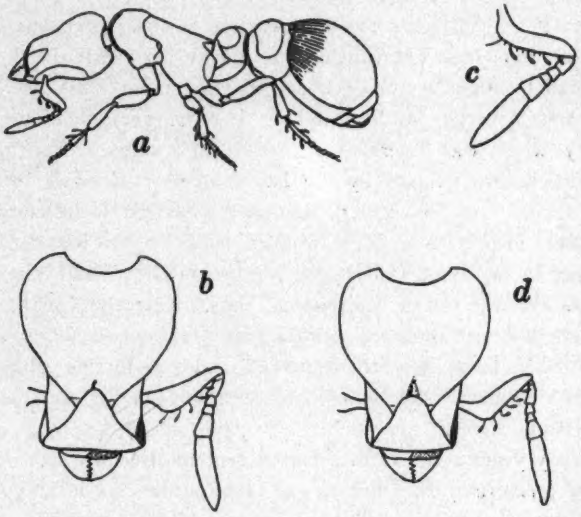


Figure 1. *Strumigenys (Cephaloxys) membranifera* Emery. *a,* worker; *b,* head; *c,* antenna; *d,* dorsal view of head of the subspecies *simillima* Emery. (After Emery)

shining surface, the body is of a distinctly deeper ferruginous color, the clavate hairs of the vertex, antennal scapes, legs, venter and tip of gaster and the spongiform appendages of the petiole and postpetiole are more sordid and not pure white as in the typical Italian form. Since these characters are not mentioned by Emery the Mississippi form may be regarded, at least provisionally, as a distinct variety, for which I suggest the name *marioni* var. nov.

The worker specimens taken by Dr. Williams in Hawaii and which I shall call var. *williamsi* var. nov., closely resemble those

of *marioni* in color and in the shape of the head, but the pronotum as well as the remainder of the thorax seem to be even smoother and more shining, and the umbilicate punctures of the head somewhat more discrete and more regular. The impression representing the frontal area, however, is small and indistinct as in the typical *membranifera*. The hairs and spongiform appendanges are distinctly yellow.

A single deälated female differs from the worker in having the head broader, with much more pronounced, sharply rectangular anterior corners. Thorax short, highest through the scutellum; humeri of pronotum, which is not marginate as in the worker, forming a pair of rounded protuberances; mesonotum small, convex, longer than broad, narrowly rounded anteriorly; base of epinotum shorter than the declivity and forming nearly a right angle with it in profile. Petiolar and postpetiolar nodes broader than in the worker, the former transversely subrectangular, nearly twice as broad as long. Sculpture as in the worker but the thorax subopaque; pronotum finely rugulose; mesonotum and scutellum covered with dense umbilicate punctures like those on the head; mesonotum with a few clavate hairs on its lateral borders. Ocellar area infuscated. In other respects very similar to the worker. Length about 1.5 mm.

The distinguishing characters of the various forms of *membranifera* are so slight that their precise taxonomic rank cannot be determined without additional material. Emery confesses that he would not have regarded *simillima* as a subspecies if the type had been taken in Europe. I am inclined to regard it as a mere variety like *santschii*, but if the geographical distribution instead of the slight and elusive characters of the four forms is stressed, they might all be regarded as incipient subspecies.

Like the other small species of Dacetonine ants belonging to Acanthognatus Mayr, Strumigenys F. Smith, Cephaloxys F. Smith, Epitritus Emery, Glamyromyrmex Wheeler, Codiomyrmex Wheeler, Codioxenus Santschi, Pentastruma Forel, etc., *membranifera* is a member of Silvestri's "microgenton," the curious fauna of minute, poorly pigmented, blind or myopic organisms which inhabit the soil and are rarely taken at the surface except after

abundant rains. Hence the precise limits of distribution of any of the species of the genera and subgenera above mentioned cannot be defined at the present time. The whole cosmopolitan tribe Dacetonii is evidently both very ancient and very highly specialized. Now that the Berlese and Silvestri funnels are being more generally used by collecting entomologists, our knowledge of these very interesting ants should increase rapidly.

ANNUAL ADDRESS

The Causes of Fluctuations of Populations of Insects

ROYAL N. CHAPMAN

(Presented at the meeting of December 1, 1932)

The fluctuations of insect populations and the levels which they attain are of primary interest to society in general, for they often determine the value of our crops, the welfare of our domesticated animals and the health of our communities. The environmental factors which influence these population levels and their fluctuations, and the mechanisms through which they act upon the populations are of primary importance to the entomologist.

Fifteen years ago, when I first became interested in this subject and became convinced that it was of the greatest importance in entomology, I searched the literature for titles pertaining to it. However, one of the most interesting and stimulating papers that I found was not indexed in such a way that I could find it in my systematic search of papers on populations. I stumbled upon it accidentally. It was under the title "Presidential Address" by F. Muir of the Hawaiian Entomological Society, delivered on the 18th of December, 1913. Muir considered the effect of parasites and predators upon populations and the struggle for existence. By a few simple arithmetical calculations he showed the theoretical trends of hosts with and without parasites, and illustrated the rôle which predators might play in maintaining populations at a constant level.

Since this time a considerable amount of literature has accumulated on this subject. In general we might divide this literature into two groups: the one written from a viewpoint which is primarily mathematical, and the other group written by biologists whose considerations have been based mainly upon observational data and whose conclusions have been reached largely through philosophizing on the basis of their observations. There have been a few biologists who have indulged in enough mathematics to

make it difficult to know to which group their papers belong; but in general the biologists have revolted against the mathematics. They have had the general feeling that these phenomena are too complicated to be represented by mathematics. On this point I cannot resist the temptation to digress and call your attention to a quotation from the classic works of Fourier, the French savant who was faced with the same argument when he was struggling with the application of mathematics to thermodynamics. He was faced with the contention that mathematics was applicable to surfaces and solids and not to anything as diffuse as heat and its transmission, just as we are now faced with the contention that mathematics may be applied in engineering, but not to such problems as the biotic control of insect pests.

"Profound study of nature is the most fertile source of mathematical discoveries. Not only has this study, in offering a determinate object to investigations, the advantage of excluding vague questions and calculations without issue: it is besides a sure method of forming analysis itself, and of discovering the elements which it concerns us to know, and which natural science ought always to preserve: these are the fundamental elements which are reproduced in all natural effects.

"We see, for example, that the same expression whose abstract properties geometers had considered, and which in this respect belong to general analysis, represents as well the motion of light in the atmosphere, as it determines the laws of diffusion of heat in solid matter, and enters into all the chief problems of the theory of probability.

"The analytic equations, unknown to the ancient geometers, which Descartes was the first to introduce into the study of curves and surfaces, are not restricted to the properties of figures, and to those properties which are the object of rational mechanics; they extend to all general phenomena. There cannot be a language more universal and more simple, more free from errors and from obscurities, that is to say more worthy to express the invariable relations of natural things.

"Considered from this point of view, mathematical analysis is as extensive as nature itself; it defines all perceptible relations, measures times, spaces, forces, temperatures; this difficult science

is formed slowly, but it preserves every principle which it has once acquired; it grows and strengthens itself incessantly in the midst of the many variations and errors of the human mind.

"Its chief attribute is its clearness; it has no marks to express confused notions. It brings together phenomena the most diverse, and discovers the hidden analogies which unite them. If matter escapes us, as that of the air and light, by its extreme tenuity, if bodies are placed far from us in the immensity of space, if man wishes to know the aspect of the heavens at successive epochs separated by a great number of centuries, if the action of gravity and of heat are exerted in the interior of the earth at depths which will always be inaccessible, mathematical analysis can yet lay hold of the laws of these phenomena. It makes them present and measurable, and seems to be a faculty of the human mind destined to supplement the shortness of life and the imperfection of the senses; and what is still more remarkable, it follows the same course in the study of all phenomena; it interprets them by the same language, as if to attest the unity and simplicity of the plan of the universe, and to make still more evident that unchangeable order which presides over all natural causes."

To agree with Fourier it is not necessary to forget the extreme complexity of our subject matter. A divergence of interest along the two lines indicated is quite natural. We have on the one hand the problem of devising the mathematical expressions which indicate all the possible relationships which may arise. In these expressions it is expedient to use quite arbitrary values to represent the numbers of organisms present and the rates of their development. On the other hand, to apply these mathematics, it is necessary to devise means determining how many organisms are present and how rapidly they are developing. Appalled though we may be by the complexity of the problem we, as entomologists, are committed to it. Our attempts to control the populations of insect pests may be likened to the efforts of the alchemists of old, rather than to the rational procedure of a modern engineer in synthetic chemistry. I say this as an admission rather than as an accusation, for I am directing an experiment station that has three expeditions exploring for parasites at the present time. We are willing to try anything in the hope that we may produce a pot of gold in a

pineapple field. I see no other way of proceeding at the present time, neither do I see way of escape from the perplexing problem of the behavior of populations with which we are faced. If we are to uphold our branch of science we must get away from trial and error.

It will not be possible to make a complete survey or give an exhaustive discussion of all the literature on this subject. Following Muir we have Thompson calculating the trends of host and parasite populations in order to determine what the possibility of control would be if different parasites were introduced for certain pests. It is true these calculations of the number of generations required for parasites to overcome hosts are highly theoretical. On the other hand, in the development of these theories Thompson called attention to many fundamental phenomena and many interesting conceptions of population phenomena. The argument of many biologists that it is too theoretical is not to be given too much attention for we may be reminded that the science of physical chemistry rests fundamentally upon the work done by Willard Gibbs, which even at the time of its publication was considered to be too theoretical to be of any particular value.

The most encouraging development in the application of mathematics to the phenomena of animal population is the advent into the field of the distinguished mathematician, Professor Vito Volterra, of the University of Rome. His interest was attracted to the field through a conversation with M. D'Ancona, who had been studying the fluctuations of the populations of fish in the Adriatic Sea. A summary of Volterra's work up to 1928, translated into English, has been included as an appendix to my volume "Animal Ecology." Since that time his theories have been further developed and presented in a series of lectures at the Sorbonne in Paris. They have appeared in printed form under the title "Lecons sur la Théorie Mathématique de la lutte pour la vie," published in 1931.

I would grant the contention of the biologists that Volterra has made many assumptions with regard to the forces of reproduction and death. However, we must admire the logic in his treatment of the subject, beginning with the biological association of two species which contend for the same food, the consideration of association

of two species, one of which feeds upon the other, and his addition of one complicating factor after another until he comes to the case of any number of whatever species, some of which feed upon others, and finally his treatment of conservative and dissipative biological association.

Among his deductions are included what he calls the three fundamental laws of fluctuation. They are stated as follows:

1. *Law of the Periodic Cycle.*—The fluctuations of the two species are periodic, and the period depends only upon the coefficients of increase and decrease and the initial conditions.

2. *Law of the Conservation of the Averages.*—The averages of the numbers of individuals of the two species are constant whatever may be the initial values of the numbers of individuals of the two species just so long as the coefficients of increase and decrease of the two species and those of protection and of offense remain constant.

3. *Law of the Disturbance of the Averages.*—If an attempt is made to destroy the individuals of the two species uniformly and in proportion to their number, the average of the number of individuals of the species that is eaten increase and that of the individuals of the species feeding upon the other diminishes.

These deductions are worthy of our consideration. Do the numbers of populations of two species fluctuate periodically when other conditions are remaining constant? Will the numbers of individuals of a species rise to a point of saturation if conditions remain constant? If we use some mechanical or chemical means of combating an insect pest and destroy the pest and its parasites together, will the result be an increase in the pest and a decrease in its parasites?

The only constructive reaction to these propositions is to formulate a method of experimentation whereby the truth or fallacy of Volterra's deductions can be demonstrated. Some biologists, notably those of the school of Raymond Pearl, of Johns Hopkins University, have been attempting to express in mathematical form the results of various experiments with populations. Gause (1932) of the Timiriasev Institute for Biological Research, Moscow,

Russia, is one of these. He has formulated expressions of the effect of various environmental factors upon the populations of *Tribolium confusum*, grasshoppers and yeasts.

Turning our attention now to the entomologists themselves, we find a group in Germany interested in the general phenomena of population growth, particularly as it affects outbreaks of insects. Martini (1931), Zwolfer (1932), Bodenheimer (1930), and Eidmann (1931) have published papers based mainly upon evidence gathered during epizoötics of insects. In the main they, like other zoologists, have looked to great changes in physical factors to explain the changes in population levels. Eidmann is inclined to agree with Elton that sun-spot cycles have a profound influence upon the fluctuations of animal populations. From his study of the outbreaks of certain forest insects he has concluded that they are correlated with sun-spot maxima. He believes these come in general about every ten years, and that every third one represents a high maximum. Such phenomena obviously are not subject to experimental verification; and the whole matter of sun-spot cycles and its effect upon biological phenomena rests upon a rather uncertain foundation.

Not only have many entomologists looked to the physical factors for explanation of the changes in population levels, but some of them have contended that physical factors are the only causes of fluctuations of populations; and have even denied that a condition of equilibrium between various members of a population could exist. Such problems, however, cannot be settled by assertions or denials. Neither can satisfactory proof come from observations on fluctuations of populations in the past. Conclusive evidence must come from careful experimentation. With this in mind a search was made for an insect which would be susceptible to laboratory experimentation. It should live in a stable environment; its food should not be perishable. It should be small so that large numbers could be kept in a small space and it should develop rapidly, passing through many generations in a short period of time. After the consideration of many species, the confused flour beetle, *Tribolium confusum*, was selected.

Since that time a group of students has worked with populations of this beetle under controlled conditions to determine

whether there was a hope of confirming the hypothesis of biotic potential and environmental resistance through the use of this species. In the field of genetics Drosophila was chosen for intensive study, with the result that the inheritance of characters was not only traced to specific chromosomes, but genes were described and located, and their behavior recorded. More significant still, the fundamental principles derived from the study of Drosophila were found to hold not only for other animals, but for plants as well.

The ambitious program for the intensive study of Tribolium populations, therefore, got under way with the hope that generalizations might be made which would apply in insects in general. It was shown (Chapman, 1928) that populations of Tribolium under controlled conditions would come to a point of saturation and maintain this with only slight fluctuations. This was regardless of whether the population was high or low at the start, or whether the environment was large or small. This substantiated Volterra's "first law" of the fluctuations of populations.

Proceeding to the analysis of the situation, Sweetman and Palmer (1928) showed that in a medium of whole-wheat flour the development of *Tribolium confusum* was very constant when temperature and moisture remained constant. It was shown that the addition of excess wheat embryo or other food accessories to the medium made no difference in the rate of development so long as the whole-wheat flour was used as a ration. It was thus demonstrated that the environmental factors of temperature, moisture and food could be satisfactorily controlled to the point of producing a constant effect on the beetles.

Chapman and Baird, unpublished manuscript, made a study of the biotic constants of Tribolium over a series of temperatures with controlled relative humidity. It was found that when dealing with populations of Tribolium, the times for the hatching of a group of eggs, the development of larvae and of pupae were very constant. Indeed, the coefficients of the various phenomena were quite comparable with those of physical processes. Experiments with the growth of populations under different conditions of temperature have shown that the rate of increase of a population is very precisely correlated with the biotic constants. One

can predict when the egg, larval, pupal and adult populations will change on the basis of the biotic constants when the temperature and humidity under which they are developing are known. The mathematical consideration of the growth of the population has been dealt with by Stanley (1932) in a recent paper. It will be sufficient at this point to call attention to the uniformity of the stages of population growth and the fact that populations, under the same conditions, have practically identical fluctuations as they approach equilibrium. (Fig. 1.) In his detailed analysis of the trend of the populations, Stanley was not satisfied with simple empirical formulae. He contended that the situation with regard to the population at any one time was the result of its previous history and that any damage that it might suffer was irreparable within finite time.

In the course of the study of populations under constant conditions, it was found that by varying temperature and humidity the rates at which the populations moved to their equilibrium values could be varied; and to a less extent the level which they finally attained could be influenced by these physical factors, as was pointed out by Holdaway (1932) in his study of the effect of moisture. After being satisfied with the results of experiments on the constancy of populations under constant conditions and having the results verified by workers in other institutions, as by Allee (1931) and Park (1932), the next step was to proceed on an experimental basis to offset the equilibrium of these populations. It was the plan to introduce a parasite into the system and see what effect this would have upon the equilibrium. But just before the plans for this experiment were completed, something went wrong with the cultures that had been in equilibrium. They broke down; at first in a very disorderly way. Their behavior was so disturbing that there seemed to be nothing to do but watch the disorder proceed. However, eventually they fell into a rhythmic fluctuation; and, most remarkable of all, two populations which had been handled in duplicate assumed the same synchronous rhythm as their levels sank lower and lower. (Fig. 2.) At last it was decided to kill all the individuals of both cultures and examine them carefully, whereupon it was found that they were infested with a sporozoan Protozoa belonging to the genus Adelina. This

parasite infests the larvae and kills them at about the time of pupation.

The synchronous rhythmic fluctuations were so striking and so much like those postulated by Volterra for the fluctuations of species that it was decided to sterilize all the equipment and start over with cultures set up at the equilibrium levels; and then to infest them with Adelina and watch the progress of the populations. Four cultures were set up: two at 27 degrees, and two at 32 degrees Centigrade. The growth of the parasite was inhibited at 32 degrees, and at times some of the beetles succeeded in pupating and emerging as adults. Since these cultures were set up with about 374 adults each, which were of random age, the adults of populations could be expected to gradually die out, inasmuch as they would not be replenished by new individuals. Since the life of an adult Tribolium is about a year, the oldest members of these populations should die almost at once and the youngest would all be dead in a year's time. It is interesting to note that during the 360 days during which these cultures were carried on at 27 degrees the adult population curve dropped off as a straight line. And at the end of this period of time these two populations were within ten individuals of the same number. Due to the cannibalistic habits of the larvae and adults, eggs are eaten when there are high populations of larvae to accidentally encounter them in the flour. The result is that when larvae are few, eggs are many. When the eggs hatch, the larvae proceed to the eating of eggs, with the result that the egg curves go down. The curves for larvae and eggs are then similar to those for predator and prey. As time goes on, the fluctuations of these two curves with their opposite tendencies become more and more marked, and the synchronism of the two duplicate populations is very striking. Here then is a case where physical factors were maintained constant; and the interaction of the biotic factors not only produced regular fluctuations, but in the two duplicate populations these fluctuations were strikingly similar in period and amplitude. They are not only like each other, but like the original populations which were accidentally infested.

It is unfortunate in this case that we did not have a method of recording the abundance of the protozoan parasite. Neverthe-

less, the fluctuating curves of eggs and larvae bear the relationship of prey and predator. They demonstrate periodic fluctuations of populations under physical conditions which are maintained as nearly constant as possible in a Carrier cabinet with a temperature and relative humidity control, and food changed at regular intervals. The experiment constitutes a demonstration of Volterra's first law of fluctuations; the law of the periodic cycle.

Inasmuch as the laws of fluctuations all assume that the coefficients of increase, or biotic potential, are constant, another series of experiments was set up to determine what effect a difference in the number of eggs laid or in the reproduction potentials of the insect might have upon the rates at which the populations increase and the level which they ultimately attain. The theory of biotic potential and environmental resistance rests upon the hypothesis that the rate of reproduction on the one hand, and the resistance of the environment on the other, determine the trend of populations.

It was found, as one might naturally expect, that in any population of female Tribolium there would be a normal distribution of egg-laying ability. Some females have a relatively high egg-laying rate and others a much lower egg-laying rate. Therefore, groups of females were selected, some of which had a high egg-laying rate, and others of which had a low egg-laying rate. These were set up in duplicate. The trends of these populations can be followed in Figure 2. The egg curves for populations 1 and 2 (those of the high egg-laying rates) rise more rapidly than those of populations 3 and 4; and maintain a much higher level during the first phase of population growth, as might be expected. If it were not for the cannibalistic habits of the larvae, these egg populations would have maintained these constant levels until the new adults began to lay. However, as the larval populations came up, the egg populations went down. As anticipated, the larval populations, in the case of those with a high egg-laying rate, rose to a level about equal to that which had been maintained by the eggs, and the same was true of the populations represented by the low egg-laying rate.

It was inevitable then that the numbers of pupae in the populations 1 and 2 would be higher than for 3 and 4. And, in turn, it

was inevitable that the number of adults in the first two populations should be greater than in the last two, as the populations entered the second phase of their growth. The first two populations agree very closely in all their behavior. In the early part of their history any difference that became evident in one stage was reflected by a difference in the succeeding stage. Culture No. 1 produced a few more eggs at first than Culture No. 2. Culture No. 2 later produced a few more eggs than Culture No. 1; and this in turn was followed by a larger number of larvae in Culture No. 2; and then by a larger number of pupae. At an age of 90 days there were about 10 per cent more adults in the second culture than in the first. But since the adults are carnivorous and eat their own eggs, Culture No. 1 soon had about a hundred more eggs than No. 2, and then more larvae; and this was soon followed by more pupae, and then more adults. When the F_1 daughter adults emerged and the populations entered their third phase of growth, the two populations were equal and from that time on remained practically identical.

Turning our attention now to the history of the two populations which were selected for low egg-laying rate, we find some interesting discrepancies. Through an unfortunate error in the early history of population No. 4, a portion of the record was omitted. From the level to which the larval populations arose, it may be assumed that the egg curve must have reached a level higher than that of Culture No. 3.

During the second phase of the population growth, we find the greatest difference between the adult populations of the cultures selected for high and low egg-laying rates. This is what one would expect, for these individuals are the direct result of the eggs laid by the original adults. Unless the daughters inherited their mothers' egg-laying propensities, we might expect that the differences between the populations would disappear. The most striking thing in the entire experiment is the fact that when the F_1 daughters began to lay, the egg curve of Culture No. 3 rose higher than that of any other culture in the experiment; while that of No. 4 was lower than any other. It must be kept in mind that these egg curves do not represent solely the rate of egg laying, but they are the net result of the laying and eating that is being

done in the population. Therefore, a culture with a small number of adults may have a large number of eggs present in it, and vice versa. Culture No. 4 with its small number of eggs soon outstripped all others in the population of larvae, and after 120 days it had an enormous advantage over the others, with a resultant high population of pupae. When the F_2 adults began to emerge the population curve for No. 4 mounted rapidly until it reached the level of Nos. 1 and 2. Thus, the advantage of the high egg-laying rate on the part of the grandmothers was entirely wiped out by the time the F_2 generation appeared on the scene. Culture No. 3, since the emergence of the F_1 daughters, held the record for highest number of eggs present in any population, yet it was unable to reach the population level of the other cultures. At the age of 120 days the adults' curve was mounting as rapidly as that of population No. 4. But, although it has had the high egg population, it has not been able to maintain a high larval population. It consequently found itself at 140 days with a low pupal population. Cultures 1, 2, and 4 reached the saturation point during the third phase of their growth, and from this point on the eggs will have little chance of escaping being eaten during the period required for hatching. In Culture No. 3, however, the chances of hatching are better, for there are fewer adults present. Consequently, it has been able to make slow but steady gains, and is at the present time at a level less than 10 per cent below that of the other three populations. This discrepancy of less than 10 per cent is negligible as compared with the data used by the observational biologists. In fact, the adult curves described for these four cultures from the beginning agree more closely with each other than the data used by many of our mathematically inclined contemporaries. But with the experimental technique one is permitted to examine into the smallest discrepancies and to seek their explanation. One must remember that the numbers which have been given as population values are exact counts of the entire populations and not estimates. They seem to indicate that, complicated though the problem may be, it is not beyond the possibility of attack.

To summarize, the Tribolium studies have thus far demonstrated that:

1. Populations will rise to a point of saturation which is independent of the size of the environment and of the initial population, so long as other environmental conditions remain constant. This is a substantiation of Volterra's "Law of the Conservation of the Averages."

2. Populations consisting of members, some of which feed upon the others, fluctuate periodically regardless of the fact that the physical conditions of the environment are constant. This is essentially a substantiation of Volterra's "Law of the Periodic Cycle."

3. If a population is started from individuals with a reproductive potential below that of the mean for their species, the immediate effect is to retard the rate of population growth, but the population will ultimately reach its normal saturation because the daughters of the next generation will tend to conform to the mean reproduction potential for their species. Any advantage or disadvantage which individual members of a population may possess will be lost in the next generation unless inherited.

As remote as these beakers of flour beetles may seem from the problems of pineapple and sugar cane fields, they may after all be no more remote from the practical things of life than the geneticist's cultures of Drosophila in milk bottles, which have made more fundamental contributions to the practical problems of breeding animals and plants than all the research on domesticated animals put together. Progress will admittedly be slow, but the results seem to be nature's own answer to the question of what factors influence population fluctuations.

BIBLIOGRAPHY

Allee, W. C. Animal Aggregations. Chicago: University of Chicago Press. 1931. 431 pages.

Bodenheimer, F. S. Über die Grundlagen einer allgemeinen Epidemiologie der Insektenkalamitäten. Zeitschr. f. angen. Entom. 1930; 16:433-450.

Eidmann, H. Zur Kenntnis der Periodizität der Insektenepidemien. Zeitschr. f. angen. Entom. 1931; 18:537-567.

Fourier, J. B. J. The Analytical Theory of Heat. Translated with notes by Alexander Freeman. Cambridge University Press. 1878; 466 pages.

Gause, G. F. Ecology of Populations. Quarterly Review of Biology. 1932; VII: 27-46.

Holdaway, F. G. An Experimental Study of the Growth of Populations of the "Flour Beetle" *Tribolium confusum* Duval, as Affected by Atmospheric Moisture. Ecological Monograph. 1932; 2:261-304.

Martini, E. Zur Terminologie in der Lehre vom Massenwechsel der Organismen. Zeitschr. f. angen. Entom. 1931; 18:440-459.

Muir, F. Presidential Address. Proc. Hawaii. Ent. Soc. 1914; 3:28-42.

Park, Thomas. Studies in population physiology: the relation of numbers to initial population growth in the flour beetle *Tribolium confusum* Duval. Ecology 1932; 13:172-181.

Stanley, John. A Mathematical Theory of the Growth of Populations of the Flour Beetle, *Tribolium confusum* Duv. Canadian Journal of Research, 1932; 6:632-671.

Sweetman, M. D., and Leroy S. Palmer. Insects as Test Animals in Vitamin Research. Jour. Biol. Chem. 1928; 77:33-52.

Volterra, Vito. Variations and fluctuations of the number of individuals in animal species living together. In "Animal Ecology," by R. N. Chapman. McGraw-Hill. 1931. Pages 409-448.

Zwölfer, W. Zur Lehre von den Bevölkerungsbewegungen der Insekten. Zeitschr. f. angen. Entom. 1932; XIX:1-21.

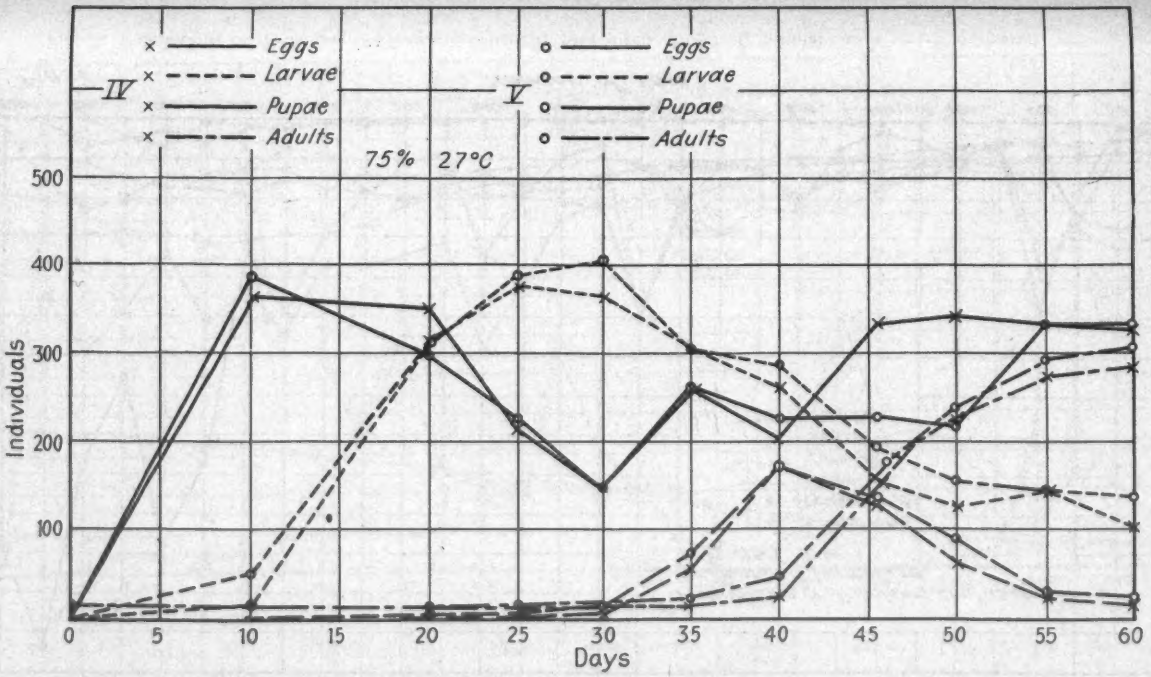


Fig. 1. Population trend of *Tribolium confusum* Duval at 27 degrees C. and 75 per cent of relative humidity. Two populations, IV and V compared.

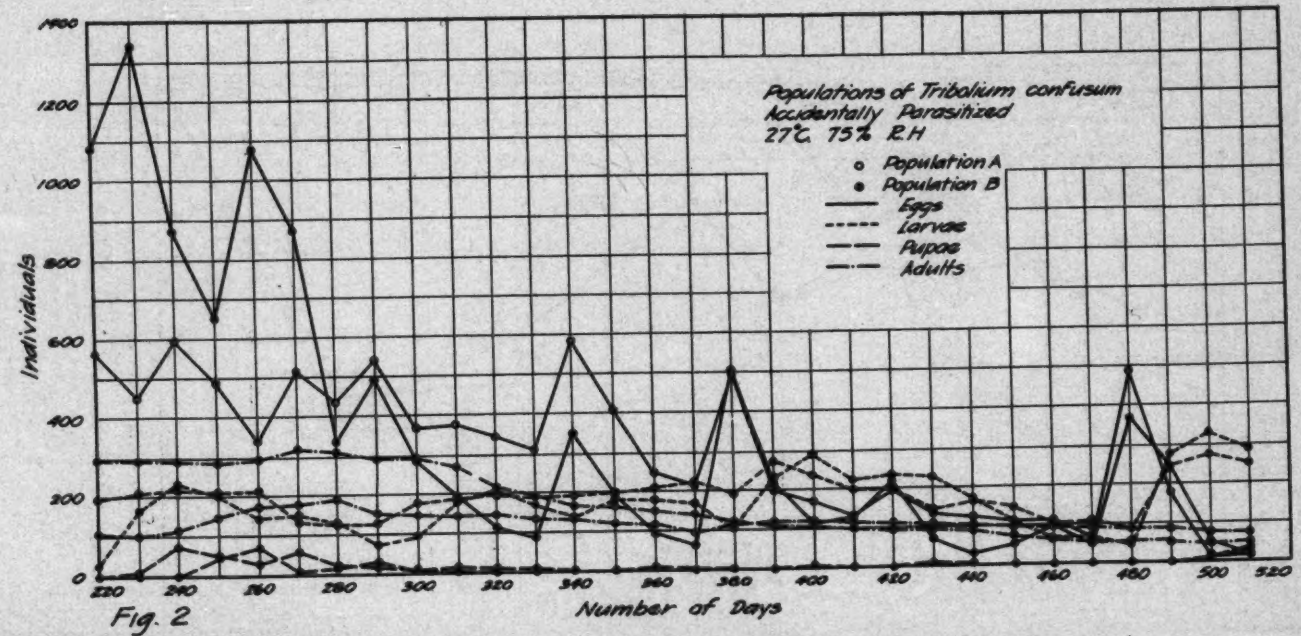


Fig. 2. Populations of *Tribolium confusum* accidentally parasitized. Duplicate populations A and B compared.

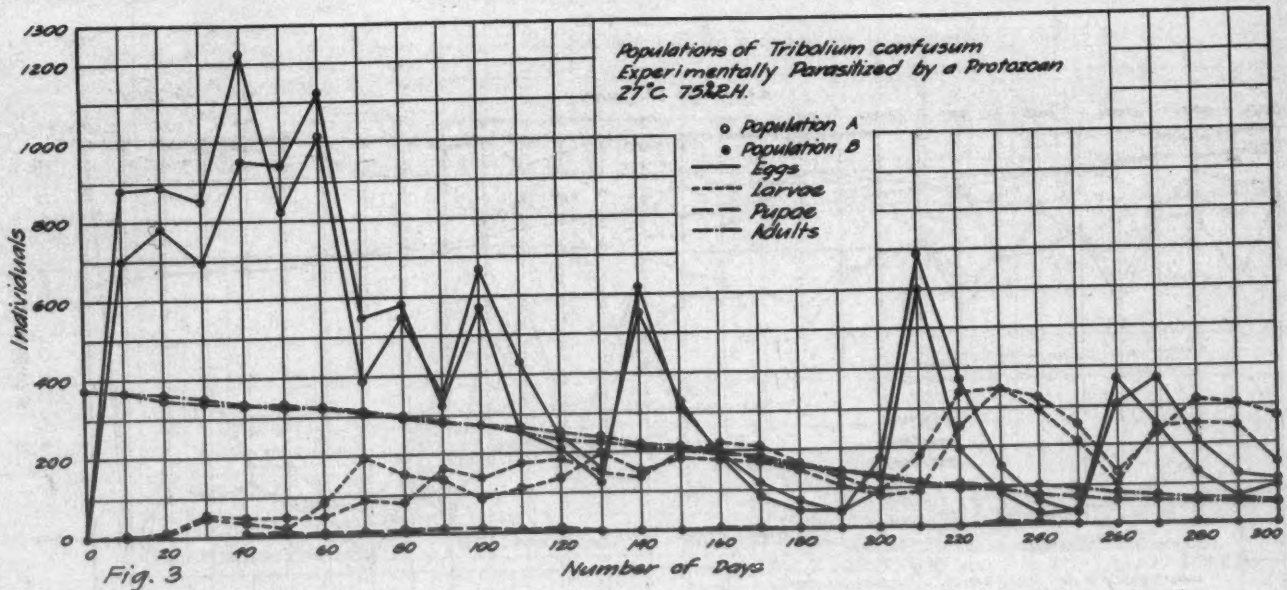


Fig. 3. Populations of *Tribolium confusum* experimentally parasitized by a protozoan, *Adelina*, at 27 degrees C. and 75 per cent of relative humidity. Duplicate populations A and B compared.

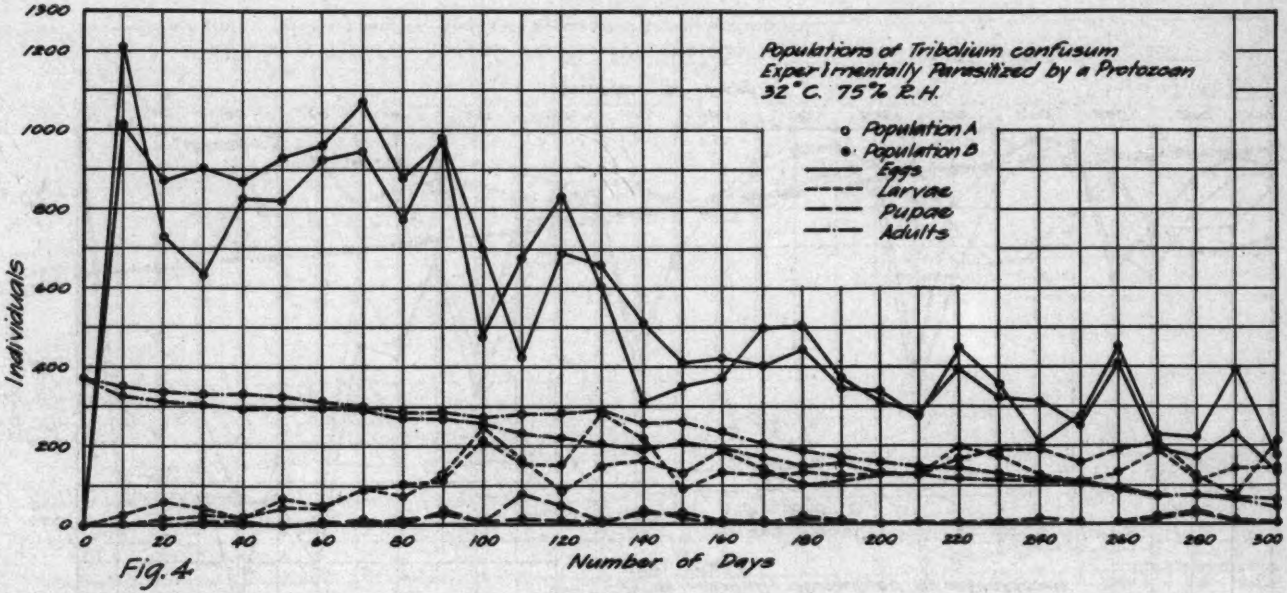


Fig. 4. Populations of *Tribolium confusum* experimentally infested with *Adelina* at 32 degrees C. and 75 per cent of relative humidity. Duplicate populations A and B compared.

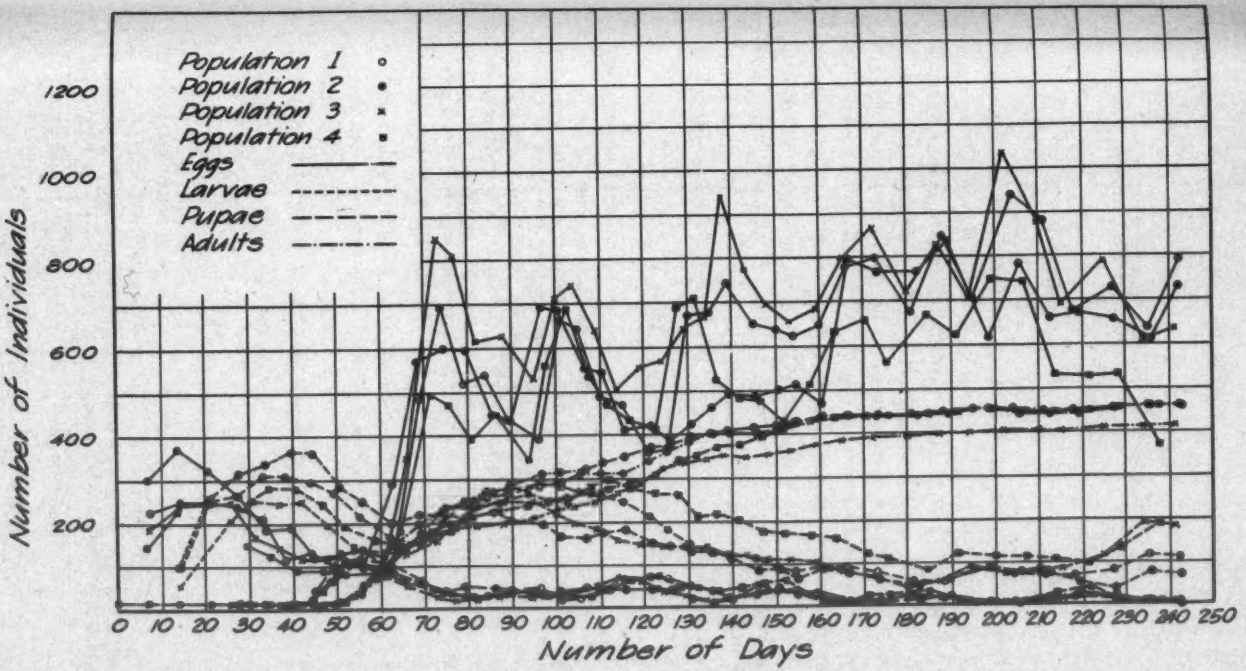


Fig. 5. A comparison of populations of *Tribolium confusum* originally selected for high and low egg laying rates. Populations 1 and 2 were started with females having a high egg-laying rate. Populations 3 and 4 were started with females having a low egg-laying rate.

New Hawaiian Lepidoptera

BY O. H. SWEZEY

(Presented at the meeting of December 1, 1932)

While making studies on the insect faunas of the native forest trees of the high plateau of Kauai in the vicinity of the Kokee summer camps in June and July, 1932, several new moths were discovered, which are herein described. These were all reared from larvae found in their respective natural habitats. This is an indication of the possibilities of the discovery of more new species when there is further opportunity for research in that region. A new moth from the Waianae Mts., Oahu, and some notes on a few other Hawaiian moths are herewith included. Types of the new species are deposited in the collection of the Hawaiian Entomological Society.

PHYCITIDAE

Homoeosoma bidensana n. sp.

Male, 17 mm., female, 18-27 mm. Whole insect nearly uniformly brownish fuscous. Forewing having two oblique bars of white scales, one arising at about 1/5 of costa and extending obliquely to about middle of dorsum, the other arising at about 4/5 of costa and extending obliquely across wing parallel to termen. Sometimes a suffusion of white scales on part of the middle of wing between the white bars, and also near termen. Veins 4 and 5 of forewings coincident as in *humeralis*. Very distinct from other Hawaiian species of the genus.

Described from 1 male and 3 females reared from larvae boring in the stems of *Bidens cosmoides;* pupation takes place within the stem.

Hab.—KAUAI, Kumuwela, June 25 and July 15, 1932; Nualolo, June 26, 1932 (Swezey).

PYRAUSTIDAE

Phlyctaenia violae n. sp.

Male, 20 mm. Antennae brownish fuscous, with some white scales on basal joint. Palpi with brownish fuscous and white scales mixed. Head white, with a fuscous median spot on frons and a few fuscous scales on

occiput. Thorax brownish fuscous on disk, patagia and apex ochreous. Forewings white on disk; basal fourth with a slight suffusion of fuscous; a heavy fuscous bar obliquely from about 1/5 of costa extending 2/3 towards dorsum, widened distally, from distal end two fuscous sinuate lines wide apart extend to dorsum; costa fuscous except for two white spots enclosing a fuscous spot at 2/3, from this spot a sharply sinuous fuscous line extends to vein 2; 8-shaped discal spot outlined with fuscous, heavier on costal side; a series of fuscous dots on termen, preceded by a slight fuscous suffusion which is more dense near apex; cilia fuscous and white mixed, entirely fuscous at base. Hindwings nearly uniformly light fuscous, with a darker discal dot and an indistinctly indicated postmedian fuscous line; cilia white, fuscous at base. Abdomen light fuscous with indications of white rings on apical margins of segments. Legs fuscous, tibiae white at apex and tarsi white spotted.

Reared from a caterpillar on leaves of *Viola* sp. (a native species of violet). Three caterpillars were found, but two proved to be parasitized. Of the latter, one died before the parasite larva obtained its growth, and from the other a parasite larva issued, spun its cocoon and eventually matured as *Cremastus hymeniae* Viereck. This adds another to the long list of hosts of *C. hymeniae*.

The full-grown *P. violae* larva was 20 mm.; light green, with white longitudinal dorsal fat bodies showing through. Head plate testaceous with slight browning on the sides, eyes black. A black longitudinal bar on each lateral margin of cervical plate. The larva spun up between leaves, and the pupa was formed February 19, from which the adult moth issued March 3, 26 days from the date of capture, February 5.

Hab.—OAHU, Puu Kanehoa, Waianae Mts., Feb. 5, 1933 (Swezey).

Phlyctaenia platyleuca Meyr.

One moth was reared from a larva on leaves of *Urera sandwicensis*, Kamokuiki Valley, Waianae Mts., April 2, 1933. Larvae were quite numerous on the trees, the latter being quite numerous and larger than I had observed elsewhere. A species of Sierola was present. A caterpillar was found on which 3 Sierola larvae had just finished eating. They spun cocoons, but died without maturing. Three *Casinaria infesta* (Cress.) larvae issued from as many caterpillars and produced cocoons, from which the adults issued April 20. The only previous rearing of this species of Phlyctaenia was from *Touchardia latifolia* on Mt. Tantalus, 1908 and 1909. This is a closely related tree.

Tortricidae

Capua pterotropiana n. sp.

Male, 16-17 mm. Antennae cinereous, strongly banded with brownish fuscous above, a few of the basal segments entirely brownish above; scape white with a few scattered brownish scales above or entirely brownish above. Palpi white, first and second joints brownish fuscous externally except at apex of second joint, terminal joint whitish or sometimes with scattered fuscous scales. Head white, with a few pale brownish scales posteriorly. Thorax brownish, with mixture of yellow, green and fuscous scales; patagia brownish tipped with white. Forewings pale greenish white with patches of fuscous brown: a patch occupying about basal fourth of wing and containing a few greenish scales at base dorsally; a large irregular triangle with its base occupying costa from about 1/3 to 3/4, its apex on fold with a projection towards tornus, some greenish scales near costa in middle of base; a row of marginal spots on dorsum and termen and apical part of costa, some of these spots larger, particularly one about middle of dorsum and one about middle of termen; a pair of white spots on costa at 1/3, another pair at 2/3 and another pair towards apex; terminal cilia tawny greyish. Costal fold extends to the beginning of the base of large triangle, white at tip and a larger white patch a little before tip. Hindwings and cilia tawny greyish. Abdomen tawny greyish, anal tufts ochreous. Fore and middle legs fuscous with pale bars; hind legs tawny greyish.

Female, 22-24 mm. Similar to male but larger; disc of thorax mostly pale greenish; the basal brown patch of forewing is divided longitudinally by a greenish patch; an oval brown spot in midde before termen.

Described from 2 males and 6 females reared from larvae in terminal buds of *Pterotropia kauaiensis*. Apparently allied to *Capua* (?) *glaucoviridana* Walsm., which was described from a single female from Kaholuamano, Kauai, but larger than it in size and the brownish patches are more distinct and larger in size.

Hab.—KAUAI, Halemanu, June 22, 1932 (Swezey).

Capua oheoheana n. sp.

Male, 9-10 mm. Antennae cinereous, banded with dark fuscous above. Palpi cinereous, fuscous externally, terminal joint short almost entirely fuscous. Head and thorax brownish fuscous. Forewings variegated, mostly brownish fuscous; a pair of whitish costal spots at about 1/3 and another pair at about 2/3, from the first pair of spots a band with somewhat of whitish suffusion crosses the wing, the basal portion before this band is somewhat suffused with orange scales; a few orange scales scattered throughout the wing, a scattering of silvery white scales throughout; cilia fuscous; no costal fold. Hindwings and cilia dark fuscous. Abdomen fuscous, anal tufts pale. Legs mostly cinereous, banded with fuscous.

Female, 11 mm. Similar to male, except that the whitish band from 1/3 of costa is more distinct and wider, twice as wide on dorsum as on costa, having a few ochreous scales; another similar band from 2/3 of costa obliquely to tornus, with a projection to near apex of costa, thus making a

Y-shaped area or spot. Distinctly different from other Hawaiian species of Capua.

Described from 4 males and 1 female, collected and reared from *Pterotropia kauaiensis*, larvae and pupae found in dead twigs. The name is from "ohe ohe," the native name of the tree. As treated in the Fauna Hawaiiensis, this species would fall in the genus Epagoge on account of the absence of costal fold in the male. However, Meyrick, in the Revised Handbook of British Lepidoptera (1928) in the description of Capua, says: "Forewing of male with or without costal fold," and places in the genus Capua the species which were under Epagoge in his Handbook of British Lepidoptera, of 1895. Hence, it might be inferred that Epagoge is to be considered as synonymous with Capua.

Hab.—KAUAI, Halemanu, June 29, 1932 (Swezey).

Tortricidae

Eulia lysimachiae n. sp.

Male, 17 mm. Head and thorax not in perfect condition, but apparently nearly uniformly tawny greyish. Forewings tawny greyish, with faint fuscous strigations; at 1/5 of costa a larger or more conspicuous one extends about 1/4 across the wing; at 1/3 of costa a broad fuscous band extends obliquely to the fold; on costa beyond this, two large fuscous spots followed by a few smaller ones before the apex; dorsally from the two large costal spots are two other fuscous spots, one oval, the other larger and irregular in outline, they tend to be connected; terminal area with brownish suffusion, widest a little beyond apex and narrowing to termen; a narrow costal fold on basal fourth of costa. Cilia of termen ochraceous, with some fuscous scales towards apex. Hindwings tawny cinereous with numerous small faint fuscous spots and strigulae; cilia cinereous. Abdomen tawny greyish. Fore and middle legs fuscous; hind legs paler.

Described from one male reared from larva on leaves of *Lysimachia hillebrandi* var. *venosa*.

Hab.—KAUAI, Kalalau Trail, about 3800 ft. elevation, June 23, 1932 (Swezey).

Eucosmidae

Crocidosema marcidellum (Walsm.)

One specimen of this moth was reared from a larva found boring in a petiole of leaf of *Abortopetalum sandwicense* in Makaha Valley, 1850 ft. elevation, March 30, 1933, by Mr. Glenn Russ. Five specimens were reared from the same plant in Kamokuiki

Valley, about 2000 ft. elevation, Waianae Mts., April 13, 1933 (Swezey and Williams). The petioles in which larvae are boring become considerably swollen. The only previous rearing of this moth was from fruits of *Hibiscus arnottianus* on Mt. Tantalus, 1914 and 1924 (Swezey).

Diplosaridae

Bubaloceras pritchardiae n. sp.

Male, 21 mm. Antennae brownish ochreous, more intensely so on the widened curved basal joint. Palpi whitish ochreous. Head and thorax brownish ochreous, head whitish ochreous in front, patagia with whitish margins, collar whitish, some whitish scales at apex. Forewings brownish ochreous, with a few scattered fuscous scales, some of them arranged in obscure dots; one elongate about middle of cell, two on fold, and one at discocellulars; cilia brownish ochreous, paler towards dorsum. Hindwings and cilia cinereous, apical cilia brownish ochreous. Abdomen cinereous, anal tufts concolorous. Legs cinereous, somewhat infuscated dorsally.

Female, 22 mm. Similar to male except for sexual characters.

Described from one male and three females (2 cripples) reared from larvae feeding in the abundant fulvous cottony tomentum, with which the spathe and other parts of inflorescence of *Pritchardia eriophora* is clothed. The moths are about the color of this cottony substance. Distinct from the only other known species of the genus, which is nearly white, and occurs on Molokai. The large curved and widened basal joint of the antenna with its hair pecten determines the genus.

Hab.—KAUAI, Kumuwela, July 1, 1932 (Swezey).

Gracilariadae

Parectopa ureraella (Swezey)

Mines of this moth were found abundant in leaves of *Urera kaalae* near Puu Kaua, Waianae Mts., Nov. 6, 1932. A few specimens were reared. They vary slightly from those that have been reared previously from *Urera sandwicensis* on Mt. Tantalus.

Plutellidae

Acrolepia aiea n. sp.

Male, 8 mm. (undersized from lack of food). Antennae whitish, strongly banded with black. Palpi whitish ochreous, with wide fuscous band on median segment externally and two fuscous bands on terminal segment

externally. Head whitish ochreous, with a few fuscous scales at base of antennae. Thorax ochreous and fuscous mixed. Forewings ochreous, fuscous and white, the fuscous scales with a tendency to be arranged in strigulae and costal spots, more generally distributed on basal fourth, and on terminal area; the white is chiefly in a wide band directly across wing from about 1/3 of costa, which is nearly divided by an incomplete line of fuscous scales, there are white costal spots, and a few white scales scattered throughout; terminal cilia fuscous, with a white spot near middle of termen. Hindwings and cilia cinereous fuscous, fading to nearly white on basal half. Abdomen cinereous, anal tufts concolorous. Legs cinereous, strongly barred with fuscous.

Described from a single male reared from mine in leaf of *Nothocestrum latifolium*. Named with the native name of the host tree. Allied to *Acrolepia nothocestri* Busck on Oahu, but the latter lacks the white band on the forewing, though it has a large white spot on dorsum in the position of dorsal end of the white band of forewing of *A. aiea*.

Hab.—KAUAI, Kumuwela, July 15, 1932 (Swezey).

Notes on Tromatobia rufopectus (Cress.), a recent Immigrant in Hawaii (Hymenoptera)

BY O. H. SWEZEY

(Presented at the meeting of December 1, 1932)

This parasite in the egg cocoons of *Argiope avara* was first discovered in Hawaii by Mr. J. S. Rosa, at the Kailua substation of the Hawaiian Sugar Planters' Association, June 14, 1932, where they were issuing from an egg cocoon. The next collection of the parasite was by the writer at Kumuwela, Kauai, June 25, 1932, when a spider egg cocoon was found on a Dianella leaf, which contained 10 parasite pupae, from which the adults matured June 30. Later collections were as follows: Sept. 11, Gunsight Pass, Waianae Mts., one specimen collected; Sept. 27, Makua Valley, Oahu, an egg cocoon of *Argiope avara* collected, from which 11 parasites issued on Oct. 10; Oct. 9, an Argiope cocoon collected by Dr. F. X. Williams at Pauoa Flats, contained 8 eggs of the parasite; Nov. 7, one egg cocoon with 8 to 10 parasite eggs, collected in an abandoned pineapple field at Kunia, Oahu; Nov. 16, 8 Argiope egg cocoons were found at Kalauoa, Oahu, near together among twigs of an *Acacia confusa* tree, from all of which parasites had issued. In November, also, Dr. Williams collected spider cocoons (Pagiopalus) from cane leaves at Honokaa, Hawaii, from which three of the parasites issued early in December. Nearly every cocoon had had parasites, only one parasite in each of 6 spider egg cocoons.

Thus this parasite is known to occur on Oahu, Kauai and Hawaii, and seems to be quite effective in reducing its chief host, for *Argiope avara* is not nearly as common at present as formerly. At least three species of spiders are known as hosts. Besides Argiope and Pagiopalus, mentioned above, the egg cocoon from which parasites were reared on Kauai was of a different species, but its identity not known. In California, from whence it undoubtedly came, Tromatobia larvae are said to feed on the eggs of *Argiope argentata* and other spiders of the family Epeiridae.

In such large egg cocoons as those of *Argiope avara,* not all of the eggs are eaten by the parasite larvae. In one instance, 360 spiders hatched from eggs left uneaten by 11 parasite larvae in a single cocoon. Counts were made of the eggs in a few of these cocoons, giving 467, 750, 948, respectively. Eight to eleven parasite eggs have been found in single egg cocoons. The eggs are deposited in the loose silk of the inner part of the cocoon, near together but not in contact, and not in contact with the spider eggs. The egg is white, cylindrical, rounded at one end, pointed at the other, 1 mm. long. On hatching the larvae pass to the interior of the mass of eggs, feeding for about 3 or 4 days, when they become 6-7 mm. long, plump and yellow. Cocoons are spun, more or less attached, and the adults mature and issue in about 8 to 10 days, or 11 to 14 days from the hatching of the eggs.

In several instances larvae were isolated in separate vials and given 50 eggs apiece to determine how many eggs are required for their growth. The number eaten was a little less than 50, a few being left—42 to 45 were eaten, respectively. Allowing for 50 eggs per parasite larva, the number of eggs consumed in an Argiope egg cocoon with the maximum number of parasites (11) would be 550. As the number of eggs per cocoon is often much in excess of this, there should be a large number of eggs left for hatching. It would seem that the parasite would not have much effect in reducing this particular one of its hosts, and yet it is already noticeably less prevalent than formerly.

New Dolichopodidae from the Hawaiian Islands (Diptera)

BY M. C. VAN DUZEE, BUFFALO, N. Y.

PREFACE

BY FRANCIS X. WILLIAMS

Little is known of the distribution and habits of Hawaiian dolichopodid flies. The family is very well represented here, and more collecting will undoubtedly bring to light many new species in addition to the 32 described below by Mr. M. C. Van Duzee. Dolichopodidae are common in damp forests to very considerable altitudes. Quite a number of forms occur in the cultivated areas where there is sufficient shade and moisture to suit their needs. Several species are found about soil in greenhouses. A few may be immigrant insects, but the great majority are peculiar to the Hawaiian Islands, and, as far as collections show, each species is usually restricted to one island of the group.

The few condensed notes that follow on the habits and early stages of some of these dainty flies have been gathered during several years of intermittent study of the water-loving insects of Hawaii, and upon which the writer soon hopes to publish.

The common *Dolichopus exsul* Aldrich is found in many damp situations; it occurs about leaky faucets out of doors, along ditches, water courses, etc. It seldom alights upon clear water, but makes brisk short flights low over the water and ground and diligently explores the margins of pools and wet rocks. It is carnivorous and has been observed feeding on a dead winged form of our mountain termite (*Neotermes connexus* Snyder). A good-sized dolichopodid larva occasionally found about filamentous green algae on the edge of a waterfall back of Honolulu, or in a floating mat of algae in a little pool there, may be this species.

The extensive genus Campsicnemus, consisting mainly of not very metallic looking to even somber little flies, is of considerable interest here since many of its species spend much of their existence as adults upon the surface of water. A large percentage of these insects ride the waters of tiny cañon or gully pools, or of

Proc. Haw. Ent. Soc., VIII, No. 2, November, 1933.

bogs, seeking soft dead insects and venturing at times to pursue—vainly so far as I have observed—the larger collembolous insects that are occasionally seen nimbly leaping on the water. Such Campsicnemus flies, commonest of which on Oahu appears to be the little *C. gloriosus* Van Duzee, are active runners upon the water, quickly turning about and often progressing with the help of their wings. Since many of the poollets patronized by these flies disappear at times through insufficient rains, these insects must get along well enough on the forest floor. Several kinds of Campsicnemus are found mile high on more permanent waters on the slopes of Mauna Kea, Hawaii. Here we sometimes found them on boggy puddles in the forest or else skating gracefully on poollets of clear water along the little Nauhi Gulch stream.

However, by far the best performers upon the surface of water observed among the Dolichopodidae, or among any other insects here, are two species (more will probably be found) of rather large sooty-looking Campsicnemus, *C. nigricollis* and *C. miritibialis,* both described here by Mr. M. C. Van Duzee. The former fly occurs in the uplands of Kauai (Kokee), the latter disports itself on the more permanent streams back of Honolulu. These insects employ the middle pair of legs and their wings in propelling themselves in their sometimes almost invisibly swift graceful gyrations on the surface of the water. They travel over a more or less regular "beat" or restricted area of water and, when two flies meet, there is usually an extremely rapid scuffle for a moment. Such a beat is usually where there is a gentle current, being frequently near the head of a little pool or below a small rapids, and the flies maintain their place—when not dashing about—by regular strokes of the middle pair of legs and flicking of the wings. Patrolling thus with speed and alertness, they are able to capture the large and active collembolan, *Salina maculata* Folsom (Proc. Haw. Ent. Soc., VIII, No. 1, p. 71, figs. 105-110, 1932) that is abundant about the haunts of *C. miritibialis* and is occasionally seen on the water, and that at least at times must form one of the chief foods of this fly.

Campsicnemus flies will sometimes lay their smooth, long-oval, pale-brownish eggs on the wet cotton stoppers of their vial prison. I found the young difficult to rear. By enclosing some adult *C. gloriosus* in jars containing very wet bog mud, moss and plant

stems, I secured over 5 weeks later a single male fly of this species.

The relatively large pale gray *Hydrophorus pacificus,* here described by Mr. Van Duzee, is an accomplished skater of lowland maritime marshes and also runs over the muddy shores. The adult fly has been observed pulling out of shallow water and devouring blood worms (the larvae of our *Chironomus hawaiiensis* Grimshaw). It lays a number of dark polished long-oval eggs; its larva, also carnivorous in its muddy environment, pupates in a cocoon that in due time yields the long-legged adult fly.

F. X. W.

The present paper was prepared from a collection of more than 220 specimens, nearly all of which were taken by Dr. F. X. Williams and Mr. O. H. Swezey, largely by the former. Thirty-two species are described as new; only two of the species previously described from the Islands were found among them, one being *Dolichopus exsul* Aldrich, described by Dr. Aldrich in 1922, Proc. U. S. National Museum, Vol. 61, Article 25, p. 15. This species has been taken on the islands of Oahu and Hawaii, and so far is one of the very few species of the family known to have been taken on more than one of the Islands; the known species of Dolichopodidae have been taken on only three of the Islands. Twenty-five species have been taken on Oahu, 10 on Hawaii, and 2 on Maui.

Mr. Percy H. Grimshaw in the Fauna Hawaiiensis, Vol. III, Part 1, published December 30th, 1901, recognized 9 species of the family, all but one he described as new. That one he determined as *Psilopus patellifer* Thomson, but as it differs considerably from Thomson's description of that species I am here describing it as *Chrysosoma fraternum* new species.

In Fauna Hawaiiensis, Vol. III, Part II, published in December, 1902, Mr. Grimshaw described two more species of dolichopods. For one of these species he erects the new genus Emperoptera, describing the species as *E. mirabilis.* The wings of this form are represented by dark-brown appendages, which in his drawing look as if they might be the costal vein only. He describes this genus and species from nine specimens taken on the island of Oahu.

Liancalus metallicus Grimshaw was described from one male and two females from Hawaii. His other species are all included in the tables of species in this paper. These are: one Chrysosoma, three Chrysotus and four Campsicnemus.

The material sent me by Dr. Williams brings the known species of Dolichopodidae up to 46, which are placed in the following eleven genera: Chrysosoma, two species; Campsicnemus, 27 species; Chrysotus, five; Dolichopus, one; Emperoptera, one; Hydrophorus, one; Liancalus, one; Medetera, three; Sweziella, one; Syntormon, one, and Eurynogaster, three. Two of these genera are new: Eurynogaster and Sweziella. All holotypes and allotypes are in the collection of the Hawaiian Entomological Society in Honolulu, except that of *Chrysosoma fraternum* new species. I wish to thank Dr. Williams very much for sending this material to me for study. The collection proved of special interest, especially the remarkable number of forms of the genus Campsicnemus, many of which are water skaters.

I also want to thank Dr. Aldrich for loaning me two pairs of Chrysosoma from the National Museum Collection and sending me a copy of Thomson's description of *Psilopus patellifer*, making it possible to describe *Chrysosoma fraternum* as new.

Chrysosoma fraternum new species.

Male: Length 5 mm.; of wing 6 mm. Face wide, shining green, portion below the suture about as long as wide, cut off somewhat straight below with a small point in the middle and slightly emarginate on each side of this point; lower half of face with rather thick white pollen; palpi and proboscis yellowish brown, former with black hair, latter with an acutely pointed triangle in the center; front shining green; ocellar-tubercule projecting, almost short cylindrical; antennae (Fig. 1) black, third joint triangular with a bare arista, which is as long as the abdomen and has a small lamella at tip (Fig. 2) which is a very little whitish at apex and has a very short, black, pubescent projection in the center of the tip; the black orbital cilia reach down to about the middle of the eyes; beard white, moderately long, but not very abundant.

Thorax and abdomen shining green with bronze reflections, latter with narrow black incisures and black hair, lower edge of sides and the venter with rather long white hair; pleura largely black, three pairs of large acrostichals; two pairs of large dorsocentrals; scutellum semicircular, green, bluish in middle, with one pair of slender bristles; hypopygium (Fig. 3) black, with its appendages mostly reddish yellow, but partly reddish brown and blackish, lamellae-like organs extending downward, one pair of curved organs extending forward from upper corners and a longer pair (Fig. 4) extending forward from the middle of the lamella; from base of upper pair

is a small slender projection with two long fine hairs, and from the base of the hypopygium is a thick central organ.

All coxae and trochanters black; front coxae with long white hair and one or two black bristles near tip; all femora green with long white hair below, which are about one and one-third times as long as width of femora; anterior pair also have two long blackish bristles near base, which are about three and a half times as long as width of femora; all tibiae yellow, front and middle ones narrowly black at tip, posterior pair more widely black at tip and with a blackish, slightly swollen ring near basal fourth; fore tibiae above with one bristle of moderate size beyond the middle and two about half as large between that and base of tibia; middle tibiae with one bristle at the middle above and a larger one near base; hind tibiae without bristles of such size; all tarsi black, plain; length of front tibiae as 87, middle as 147, and hind as 173; joints of front tarsi as 70-22-14-8-8; of middle pair as 108-35-23-12-9; of posterior pair as 90-38-23-12-8. Calypteres yellow with black tip and white cilia; halteres with brown knob.

Wings grayish hyaline; costa with very short, recumbent hairs; second vein nearly straight, only gently bent back a little at tip, running close to the costa from tip of first joint to its tip; third vein considerably and evenly bent backward from a little beyond the forking of fourth vein to its tip; fork of fourth vein at a right angle with fourth, but broadly rounded almost from its start to the tip, becoming less arched on apical half or more; cross-vein oblique, sinuous; last section of fifth vein straight as far as it reaches, which is about half way to wing margin, but continued as a fold in wing membrane to a small notch in hind margin of wing, but not in a line with the first half of the last section of the vein; length of fifth vein from cross-vein to the notch on hind margin of wing as 25, of cross-vein as 49; last section of fourth vein from cross-vein to fork as 50, from fork to wing margin as 26, but the fourth vein ends a little beyond the fork.

Female: Antennae about as in the male, except that the arista is a little shorter and very slender towards its tip; all femora, tibiae and most of front and middle tarsi yellow, narrow tips of hind tibiae and their tarsi black; front femora with two very long black bristles below on basal third; front tibiae with three long slender bristles on lower posterior surface and four stouter ones above, those below four times and longest one above three times as long as width of tibiae; front tarsi with a large stout bristle above at apical third of first joint; middle tibiae with three long bristles on anterior surface, one near base on lower posterior edge, two on middle third of upper anterior edge, two large ones on upper posterior edge of basal half, and a small one near tip on posterior surface; posterior tibiae without bristles of much size; wings about as in the male, except that the cross-vein is nearly straight. Length of front tibiae of female as 84, middle as 115, and of hind as 110. Joints of front tarsi as 61-19-11-8-8; of middle as 76-22-18-8-9, and of posterior as 30-28-18-10-8. Halteres yellow, knobs more orange colored with tip brown.

Holotype, male, and allotype, female, taken by A. Busck, September, 1915, at Kona, Hawaii. Holotype and allotype in the U. S. National Museum.

There is no doubt that this is what P. H. Grimshaw determined as *Psilopus patellifer* Thomson. If we accepted Dr. Becker's synonomy of *patelliferum* as Grimshaw's species, it has been taken in Java, Sumatra and Borneo; the type location was the small island of Guam. Becker redescribes the species from specimens from Formosa, and they certainly were not the same species as Thomson had or that we have from Hawaii, and the Hawaiian species is not the same as *patellifer* Thomson, so we have three species very much alike; also Grimshaw campares it to *globifer* Wied., and Becker to *compressum* Becker. The following table will help to separate these forms and also *leucopogon* Wied., which also has a brown ring near base of hind tibiae, but the arista has no lamella at tip.

Table of Hawaiian Chrysosoma, together with several species related to *patellifer* Thomson, to which one Hawaiian species was referred.

1. Antennae, coxae, femora, and tibiae wholly pale yellow; arista as long as abdomen, without a lamella at tip; hypopygial lamellae a pair of long, slender, yellow filaments (Oahu) (Fig. 5) *pallidicornis* Grimshaw

   Antennae, femora, and most or all of coxae black or green; hypopygial appendages not at all filiform 2

2. Front coxae yellow; arista with an apical lamella, which is black on basal, white on apical half, apical half deeply incised, fringe-like (Formosa) ..... *patelliferum* Becker (not Thomson)

   All coxae wholly black; lamella at tip of arista, if any, not at all incised 3

3. Arista as long as the abdomen, without a lamella at tip; middle tibiae with a blackish ring near tip; hind tibiae with a blackish, swollen ring near base (India; Formosa) ..... *leucopogon* Wiedemann

   Arista as long as abdomen, with a lamelliform tip; middle tibiae without a blackish ring near tip 4

4. Lamella at tip of arista at least with apical half white 5

   Lamella at tip of arista wholly black or with extreme tip white 6

5. Arista with its lamella wholly white or nearly so; scutellum with two pairs of large marginal bristles; front femora with two large black bristles at base below; front tibiae with three large bristles below (Guam Island) ..... *patellifer* Thomson

   Lamella at tip of arista with basal half black, apical half white; nearly oval, but base and tip a little pointed (China) ..... *globifer* Wiedemann

6. Hypopygium with outer, outstanding appendages simple; hind tibiae without a black tip; lamella at tip of arista wholly black; middle tibiae with two bristles below (Bengal, India) ..... *compressum* Becker

   Hypopygium with outer outstanding appendages forked at tip; hind tibiae with a rather narrow black tip; arista with its lamella white at extreme tip; front and middle tibiae without bristles below (Hawaiian Islands) ..... *fraternum* new species

Chrysotus vulgaris new species.

Male: Length 1.5 mm. Face wide, only a little narrowed below, dull black; palpi black, about as long as width of face, with whitish pollen and black hairs; front violet-blue; antennae blackish brown, third joint rounded, scarcely as long as wide; arista brown, apical; lower orbital cilia whitish.

Dorsum of thorax shining green, posterior part with bright coppery reflections; pleura black with slight blue reflections. Abdomen black with very slight blue reflections, black bristles and yellowish hair; hypopygium concealed.

All coxae almost wholly yellow, anterior pair with a few delicate yellow hairs, posterior pair without a bristle on outer surface; all femora, tibiae and tarsi pale yellow; fifth joint of all tarsi darkened, flattened and widened; front femora with a row of slender, black hairs on lower posterior surface; middle tibiae with a bristle above at basal fourth; middle and hind tibiae with bristles at tip; middle tarsi (Fig. 6) with the hairs below on first two joints a little more erect than those above; hind tarsi (Fig. 7) with the hairs below entirely erect on first two joints; length of fore tibiae as 33, of middle as 41 and of posterior pair as 49; joints of front tarsi as 15-6-5-4-4, of middle pair as 21-10-6-4-4, and of posterior pair as 10-12-6-4-5. Calypteres brown with yellowish cilia; halteres pale yellow.

Wings grayish, rather broad; third and fourth veins nearly straight, a little farther apart at tips than at the cross-vein, fourth ending in the apex of the wing; cross-vein near the middle of the wing; last section of fifth vein nearly straight; fifth vein from root of wing to cross-vein as 37, cross-vein as 8; anal angle of wing rounded, but rather prominent.

Described from one male, taken by F. X. Williams, on sugar cane, January 16, 1930, at Waialua, Oahu.

Chrysotus pallidipalpus new species.

Male: Length 1.2 mm. Face very narrow, black, eyes touching or nearly so in the middle of the face; palpi (Fig. 11) about one and three fourths times as long as the face, with white pollen and hairs; front blue-black, more violet in the middle; antennae (Fig. 10) wholly yellow, third joint rounded with long pubescence, arista brown with short pubescence; lower orbital cilia appear to be white (can scarcely be seen in the male, but white in the female).

Dorsum of thorax green, not very shining, its bristles black. Abdomen blue-black with yellowish hairs, these hairs appear more black in certain lights; hypopygium rounded, forming a rounded tip to the abdomen and more brown than blue-black, its lamella small, yellow, triangular, projecting below, fringed with moderately long hairs; central organ long, slender, inserted at lower posterior surface of hypopygium, curved under the abdomen.

Coxae, femora, tibiae and tarsi yellow; fore coxae with white hair; midle coxae blackish on basal half and tarsi a little darker toward their tips, middle pair with last three joints brown; fore femora with small hairs above and on lower part of posterior surface, where they are a little longer, below on basal three-fourths they have a few short delicate yellow hairs; hind femora with several moderately long black hairs below, one pair near tip more bristle-like; all tibiae without bristles of noticeable size, but pos-

terior pair with a row of bristle-like hairs on lower posterior edge extending their whole length, and as long as diameter of tibia; these are continued on their basitarsi, but are much shorter, all joints of hind tarsi have short, rather erect hairs below and longer recumbent hairs above; length of front tibiae as 30, of posterior as 41; joints of front tarsi as 15-6-5-5-4, of middle pair 18-8-6-3-3, of posterior pair as 9-11-7-4-3. Calypteres yellowish with black cilia, which appear pale in certain lights; halteres pale yellow.

Wings nearly hyaline, veins thin; third and fourth veins nearly straight and parallel beyond the cross-vein, fourth ending in the apex of the wing; last section of fifth vein about three times as long as cross-vein; anal angle of wing rounded, but somewhat prominent.

Female: Face black, the narrow part below grayish pollinose, face wide above, narrow and elongated below; palpi rather large, black; antennae about as in the male; posterior tibiae without the row of long hairs; middle tibiae as 40; joints of fore tarsi as 16-7-5-3-3, of middle as 19-10-6-3-3, posterior pair as 11-11-6-3-4; thorax shining green with coppery reflections; abdomen black with pale hairs.

Described from three pairs and two females, taken by O. H. Swezey, January 21, 1930, at Honolulu, Oahu, T. H., and one female, taken by F. X. Williams, on sugar cane, January 16, 1930, at Waialua, Oahu.

Table of the males of the species of Chrysotus known to be found in Hawaiian Islands.

1. Femora largely black, brown or green; antennae black 2
   Femora yellow; antennae sometimes black and sometimes yellow 3
2. Face silvery white, narrow; middle femora with two preapical bristles, one above and one below, also seven stout bristles below, the second from base the longest, those beyond about half as large (Figs. 8 and 9) (Maui) ..... *spiniger* Grimshaw
   Face rather wide, shining green; fore femora with one preapical bristle on posterior surface and two rows of six short spines below; middle and hind femora each with one row of minute spines below (Oahu) ..... *saxatilis* Grimshaw
3. Antennae wholly yellow, third joint rounded; palpi very large, pale yellow, leaf-like (Oahu) ..... *pallidipalpus* new species
   Antennae wholly black 4
4. Cilia of the calypteres and of posterior orbits black; fore coxae yellowish brown at base; fore femora with nine spine-like bristles below on apical two-thirds, basal two the longest; face narrow, silvery white (Hawaii) ..... *hawaiiensis* Grimshaw
   Inferior orbital cilia white; cilia of the calypteres black in the males, yellow in the females; fore coxae wholly yellow with black hairs (Oahu) ..... *vulgaris* new species

Campsicnemus brevipes new species.

Male: Length 1.7 mm. Eyes almost touching in the middle of the face; face white pollinose; palpi small, black or brown; front largely black or

brown, but shinging green on each side at vertex (the rest of front may be discolored); antennae (Fig. 12) wholly black, first joint gray with pollen, at least on outer surface, third joint twice as long as width of base, pointed at tip, arista basal, black; lower orbital cilia, white.

Dorsum of thorax bright, but dark shining green, with a little brown pollen and coppery reflections (its bristles broken off in type); scutellum blue with violet reflections in the middle; pleura black. Abdomen black, depressed, its hairs largely yellowish; hypopygium black, conspicuous, rounded, with black appendages.

Coxae black, posterior ones with a long, erect bristle on ourter surface (cannot see the fore coxae very well); coxae, lower part of pleura and parts of femora with a peculiar silvery white pollen, which is visible in certain lights; front femora dark yellow, apparently blackened below; front tibiae and tarsi (Fig. 13) black, former with the tip yellowish; last joint of tarsi widened; middle femora yellow with little spines below, which give it a serrate appearance on apical half; middle tibiae and tarsi (Fig. 14) black, tibiae widened and with a small black hook at tip below, a long preapical bristle on one side and two short spines near apical fourth; first joint of tarsi less than half as long as second, with two fine, hair-like bristles below near base; hind femora, tibiae and tarsi yellow, but rather dark in color, femora with a pair of bristles below near basal third and one or two near tip; none very long; tibiae with small slender bristles above, which are recumbent, not at all outstanding; length of front tibiae as 32, middle 38 and posterior as 55; joints of front tarsi as 12-5-4-3-5; of middle pair 6-14-7-5-7; and of posterior pair as 15-17-9-7-8. Calypteres dark yellow with black cilia; halteres yellow.

Wings grayish (crumpled in type).

Holotype, male, taken by O. H. Swezey, May 2, 1920, at Waialae iki, Oahu.

Campsicnemus ciliatus new species.

Male: Length 1.7 mm. Eyes contiguous; upper facial triangle, front, antennae, palpi and occiput black; lower orbital cilia whitish.

Dorsum of thorax black with brown pollen; acrostichal bristles forming one row in front and two irregular rows posteriorly; five pairs of dorsocentrals, the front pair very small; bristles of the thorax black, but appearing whitish in certain lights, especially towards their tips; scutellum with two large bristles and two pairs of very small hairs on the margin; pleura black, anterior half more dark reddish brown, a yellow spot at root of wing; abdomen black.

All coxae blackish at base for more than half their length, more reddish brown or reddish yellow on apical part, anterior pair a little more yellowish; femora dark yellow, anterior pair infuscated at base; tibiae and tarsi pale yellow; middle tibiae (Fig. 15) slightly widened, somewhat fusiform, a bristle below at tip and one near basal fourth on lower posterior edge, also a row of long bristly hairs below on most of apical half, these hairs are yellow, but appear more brown in certain lights; all joints of middle tarsi ciliated below with rather long yellowish hairs; hind femora with several bristles below near tip; hind tibiae slender, with four bristles on upper

anterior edge and three on upper posterior edge; hind tarsi with rather long, but not stout hairs; middle tibiae as 38, posterior as 65; joints of front tarsi about as 15-6-4-4-5; middle pair as 17-12-9-6-7; of posterior pair as 14-15-10-7-7.

Wings grayish; third and fourth veins nearly straight and parallel, fourth ending a little back of apex of wing; last section of fifth vein about as 22, cross-vein as 6.

Holotype, male, taken by O. H. Swezey, May 18, 1932, on Mt. Kaala, Oahu.

The only specimen of this species in the collection is in poor condition. I could not see the form of third antennal joint or much of the abdomen; the wings are crumpled some and the front legs are mostly buried in glue. The characters given will no doubt be sufficient to identify the species when taken again, although the color of the legs and front may be found to differ from that given here when fresh specimens are obtained.

Campsicnemus concavus new species.

Male: Length 2 mm. Face narrow in the middle, wider above and below, its suture near lower fourth, face covered with yellowish gray tomentum, lower part with the tomentum wholly gray, somewhat heart shaped, as long as wide; palpi black, thickly covered with gray tomentum; proboscis black; front dark blue, somewhat shining; antennae wholly black, third joint somewhat conical in outline, slightly longer than wide, arista basal, pubescent; the cilia of the posterior orbits seem to be wholly black.

Dorsum of thorax dark blue, with several acrostichal bristles; four pairs of dorsocentral bristles of nearly equal length, except the posterior pair, which are longer; scutellum with one pair of marginal bristles; pleura blackish above, yellow below. Abdomen dark green with some blue reflections and black hair; hypopygium almost wholly concealed, but seems to be gray pollinose with stiff black hairs.

Fore coxae yellow with black hair, the hair near the tip long and stiff, a row of four or five rather small, slender bristles at tip; middle coxae mostly black; hind coxae largely yellow with one black, erect bristle on outer surface; all femora yellow, posterior pair (Fig. 16) flattened, wide when seen from above or below, when viewed from the side they are narrow and much curved, concave below, with a large preapical bristle and darkened tip; all tibiae dark yellow to brownish, almost brown; fore tibiae (Fig. 17) a little concave above, with a large bristle below just beyond the middle, and a small one at tip below; middle tibiae seem to have five bristles on upper anterior edge and two on upper posterior edge of basal half, below with two bristles on middle third; hind tibiae with four or five bristles above and four below, including those at tip; length of front tibiae as 37, of middle 59, and of posterior as 65; joints of fore tarsi as 20-8-6-5-5; of middle as 22-13-10-7-8; of posterior pair as 17-17-9-8-6. Knobs of halteres yellow.

Wings grayish; fourth vein ending in the apex of the wing; last section

of fifth vein a little curved, its length as 25, cross-vein about one-third as long as last section of fifth vein.

Described from one male, taken by F. X. Williams, in pool at Pauoa headwaters, Tantalus, Oahu, September 11, 1932, at 1,500 feet elevation. This is a water rider.

I should have taken this specimen to be a female, but as the fore tibiae and posterior femora are so decidedly modified it seems sure it must be a male, although the hypopygium is concealed.

Campsicnemus flavicornis new species.

Male: Length 2 mm. Face narrow above, brown, lower half with yellow tomentum; front blackish green; occiput black with a little white pollen; antennae (Fig. 18) yellow, third joint triangular, acutely pointed at tip, second joint larger than the first; orbital cilia wholly black.

Dorsum of thorax reddish, blackened a little in the middle, especially on posterior slope; no acrostichal bristles; four pairs of dorsocentral bristles; scutellum yellow with one pair of large marginal bristles; prothorax partly blackened, with one large black bristle above each fore coxa; pleura black on upper half, lower half pale yellow. Abdomen dull black, narrowly yellow at base, its hair black, posterior margin of segments narrowly white pollinose; hypopygium mostly concealed with small silvery white hairs, small black appendages visible below; central organ projecting a little backward, yellowish white, its sheath darker yellow.

All coxae and femora and anterior and posterior tibiae and tarsi pale yellow, outer surface of middle coxae with a large black spot, anterior surface with stiff black hair; front coxae with silvery white pollen, a few delicate hairs on upper part and three stiff black bristle-like hairs on lower half; hind coxae with one large, erect, black bristle on outer surface; all femora, tibiae and tarsi with rather short, black hair; front femora (Fig. 19) nearly bare below with only a few rather short hairs towards the tip; middle femora (Figs. 20 and 21) much thickened at base, slender towards tip, with two rows of long bristly hairs below; hind femora with a row of rather long hairs on lower posterior edge; front tibiae (Fig. 19) without bristles; middle tibiae (Figs. 20 and 21) black, without bristles, except at tip and a small one near base; they have a row of long stiff hairs above and below, those above becoming longer towards the tip; front basitarsi slender (Fig. 19) thicker at base; middle tarsi (Figs. 20 and 21) wholly black with long hair above, first joint with about sixteen very long, nearly erect hairs, which have their tips bent; hind tibiae with seven bristles above, below with a small bristle beyond the middle and one at tip; hind tarsi with first joint one-fifth shorter than second; length of front tibiae as 35, middle 53 and posterior as 70; joints of front tarsi as 25-10-10-6-6; of middle as 25-14-14-9-6; and of posterior as 20-25-15-10-9. Calypteres yellowish brown with dark yellowish cilia; halteres wholly pale yellow.

Wings brownish, in poor condition in the type.

Female: Front shining blue-green; third antennal joint very small; dorsum of thorax more blackish; two acrostichal bristles form the starting of a single row on the front of the thorax; four pairs of dorsocentrals; scu-

tellum yellowish, but darker than in male; pleura, coxae, femora, tibiae and tarsi colored about as in the male, except that the middle tibiae and tarsi are yellow like the rest; fore tibiae without a bristle; middle tibiae above with one bristle at basal sixth, one at basal third, and one at apical third, below with one at basal third, tip with three bristles; hind tibiae above with one bristle at basal and one at apical third, below with one at apical third; length of front tibiae as 38, middle as 64 and posterior as 82; joints of front tarsi as 23-10-8-7-5; of middle 30-14-12-7-5; posterior pair as 22-27-16-10-7. Front basitarsi straight; all tibiae and tarsi with short hair.

Holotype, male; allotype, female, and one female paratype, taken by F. X. Williams, April 19, 1931, on Mt. Kalena, Waianae Mountains, Oahu, at 3,500 feet elevation.

Another badly broken specimen may be the same as *flavicornis*, but the bent hairs on middle basitarsi are continued on the whole length of the tibiae, and the first joint of front tarsi seems to be straight, but are buried in the glue. It was taken by O. H. Swezey at Opaeula, Oahu, July 19, 1925.

Campsicnemus gloriosus new species.

Male: Length 1.7-2 mm. Face brownish black, sometimes metallic black, moderately wide below, eyes approximated above, coming closest at upper third, lower part nearly round and covered with golden yellow tomentum; palpi black with white hair; proboscis brown with a row of minute yellow hairs on the edge; front blue-green, steel-blue or violet, wide but short; ocellar-tubercle prominent; antennae (Fig. 22) wholly black, third joint triangular, long and rather slender; arista basal, pubescent; orbital cilia black, two or three hairs below yellowish white.

Dorsum of thorax shining black, pleura pale yellow on lower half or more; no acrostichal bristles; four pairs of dorsocentrals; scutellum shining dark blue-green, or blue with one pair of marginal bristles and three or four very minute hairs between them on the apical margin; prothorax with one large black bristle above each fore coxa. Abdomen depressed, dull black with a few pale yellow hairs on the dorsum and black hairs on lower edge of the sides; venter black; hypopygium mostly concealed.

Fore coxae wholly yellow with black hair and several small bristles; all tarsi and middle and hind coxae black, coxae with yellow tips, posterior pair with one black erect bristle on outer surface; all femora yellow with black hair, hind ones a little brown at tip; fore femora with three small black bristles near tip on lower anterior side and another small one close to the tip; hind femora nearly straight, scarcely thickened, with one preapical bristle on posterior surface and a row of about ten slender, black bristles below, the longest nearly as long as width of femora, also a black bristle near tip below; front tibiae yellow, without bristles; middle tibiae (Fig. 23) black, flattened and widened, curved, so as to be considerably concave on upper edge, below with slender bristles on basal half and long fine hair on apical half, its tip (Figs. 24 and 25) projecting beyond base of tarsi and with seven curved bristles above on tip, the apical ones very long, but rapidly becoming shorter, also a straight bristle below near apical fifth;

base of tibiae (Fig. 26) with a large, pale yellow, thumb-like projection near base; hind tibiae black, straight, moderately slender, above with a pair of bristles near basal fourth, three bristles on middle third, one at tip and a row of hairs on both upper and lower edges of posterior surface, which are as long as diameter of tibia; length of front tibiae as 45, of middle pair as 56 and of posterior pair 64; joints of front tarsi as 21-12-11-6-7; of middle as 28-18-10-8-8; posterior pair as 18-16-11-7-8. Calypteres brown with black cilia; halteres yellow with the knob black or more or less blackened.

Wings uniformly tinged with brown; third vein slightly bent back at tip; last section of fourth vein nearly straight, about parallel with third, ending just back of the apex of the wing; last section of fifth vein as 25, cross-vein as 9; posterior margin of wing evenly rounded.

Female: Face formed about as in the male, wholly brown, scarcely paler below; third antennal joint (Fig. 27) about half as long as in the male; all femora, tibiae and tarsi plain; front tibiae (Fig. 28) brownish with a bristle above and below near the middle; middle and hind tibiae black; middle tibiae (Fig. 29) above with one bristle at basal fourth, one before and one after the middle (sometimes the latter missing), and one above and below at tip, also one at first and second third below; hind tibiae above with one bristle at basal sixth, one just before the middle and one a little beyond apical third, below with a small bristle a little before and one a little after apical third; length of front tibiae as 45, middle 61 and hind ones as 73; joints of front tarsi as 23-9-8-7-7; of middle 26-14-11-8-9; of posterior pair as 20-17-11-10-7. Wings with the cross-vein one-third as long as last section of fifth vein; lower part of pleura sometimes yellowish brown; knobs of halteres vary from dark yellow to blackish, and hind coxae vary in color about the same.

Described from 94 specimens of water riders; holotype, male; allotype, female, and five paratypes, taken by F. X. Williams at Pauoa headwaters, Tantalus, Oahu, on water, at 1,400 feet elevation, on February 14, 1932; 15 paratypes, taken on pools at Pauoa headwaters, Tantalus, Oahu, September 11, 1932, at 1,400 feet elevation; two paratypes, at Pupukea, Oahu, March 6, 1932, at 1,800 feet elevation, and four paratypes at Pauoa headwaters, Oahu, March 15, 1931, on water. The other paratypes were taken at these locations, in the same months; all specimens were taken on the Island of Oahu. It may be found on the other Islands, but I have not seen specimens from them.

Campsicnemus grimshawi new species.

Male: Length 2 mm. Eyes broadly contiguous, lower facial triangle brown with white tomentum on the rounded lower part; front shining blue-green; antennae (Fig. 30) wholly black, third joint triangular, slightly longer than wide, obtuse at tip, arista basal, long with long pubescence occiput black with brown pollen; orbital cilia wholly black.

Dorsum of thorax black, dulled with brown pollen; acrostichal bristles in two irregular rows; five dorsocentrals in each row; scutellum blue with one pair of bristles and a few minute hairs between them on the posterior margin; lower part of pleura yellow or yellowish brown. Abdomen dull black, depressed, with pale hairs and black bristles, seen from the side the hair appears more black; hypopygium mostly concealed with white hairs on outer part.

Fore coxae yellow with black hairs on anterior surface and a row of bristles on outer edge of apical half and across the tip; middle and hind coxae black, latter with one large, black, erect bristle on outer side; all femora yellow, front pair (Fig. 31) with a few short, black hairs below; middle femora (Fig. 32) with long, delicate hairs below, ending in a few short stiff ones and one bristle near tip; hind femora narrowly black at tip, a large black bristle above near tip and short black hairs below; front tibiae (Fig. 31) yellow on basal half, apical half blackish, above with one rather small bristle just before the middle and one below just beyond middle; middle tibiae (Fig. 32) black, a conspicuous, somewhat triangular projection below near base, beyond this with a row of moderately short, erect, black hairs, which become long yellowish and numerous on apical half, ending in a long black bristle at tip, and with one moderately long bristle on the side at basal third; hind tibiae black wtih rather long black hair above and below, upper surface with six bristles and one at tip above and below; all tarsi black, plain, with moderately long black hair, on lower surface of middle ones the hair is as long as diameter of joints, those on fourth joint erect and bent at tip. Length of front tibiae as 45, middle 62 and posterior as 90; joints of front tarsi as 27-12-12-9-8; of middle as 35-16-10-8-8; of posterior pair as 23-20-12-8-9. Calypteres and their cilia black; halteres yellow or yellowish brown.

Wings tinged with blackish brown, darker in front; fork of second and third veins nearly opposite apical third of first vein; third and fourth veins nearly straight and parallel, fourth ending in apex of wing; last section of fifth vein straight, its length as 26, cross-vein as 8; wings rather wide, not elongated, anal angle rounded, but a little prominent.

Described from four males, all taken by Swezey and Williams in October, 1931, at Nauhi Gulch, Hawaii, at an elevation of about 5,000 feet on a forest pool; one female paratype was taken at the same time.

Campsicnemus nigricollis new species.

Male: Length 3 mm. All parts of head, the thorax, abdomen, legs, feet and all hairs and bristles black; wings uniformly blackish, only the scutellum green and shining.

Antennae (Fig. 33) black, third joint about as long as wide, rounded, arista basal; eyes contiguous, lower facial triangle large; orbital cilia wholly black; dorsum of thorax with several rather long acrostichal bristles near the middle of the thorax; three pairs of dorsocentrals; scutellum with one pair of large bristles and several small hairs near apical margin; front coxae (Fig. 34) with long hair; front femora with two rows of long hairs below and one preapical bristle; front tibiae (Fig. 34) with long hairs below

and two long bristles above on middle third; first joint of front tarsi with three bristles below near base, other joints with bristles above; middle femora (Fig. 35) with two large bristles near tip, one above and one below, also with long hair on lower part of apical third, middle tibiae with five bristles above, a row of blunt bristles on the side of basal two-thirds, continued to tip by slender, acutely pointed bristles and long hairs below on whole length, their basitarsi with long hair above, which is a little shorter towards tip; hind tibiae, femora and their hair mostly white, with seven bristles above and three at tip, two above and one below; their tarsi with long hair; length of front coxae as 36, trochanters 10, femora 62 and tibiae as 50; middle tibiae as 86 and hind tibiae 100; joints of front tarsi as 25-12-12-10-9; of middle pair 20-25-16-13-10; of hind pair as 23-25-16-6-9. Calypteres, their cilia, and the halteres black.

Wings (Fig. 36) with the first and base of second vein apparently coalescent; sixth vein straight; apex of wing between the tips of third and fourth veins; last section of fifth vein straight, its length as 40, cross-vein as 15.

Holotype, male, taken by F. X. Williams, November 15, 1931, on running water at Kokee, Kauai, at 3,500 feet elevation, with a note, "active water skater."

Campsicnemus obtusus new species.

Male: Lengh 2.6 mm.; of wing 3 mm. Eyes almost touching in the middle of the face, face black, lower part covered with golden yellow tomentum; palpi black with pale hairs and black bristles; front black, vertex dark blue; antennae (Fig. 37) black, third joint rounded at tip, a little longer than wide, not at all pointed at tip; arista basal, long, one-sixth shorter than front tibia; orbital cilia and bristles under the head wholly black.

Dorsum of thorax shining blue-black, but somewhat dulled with brown pollen, which leaves a median stripe that is more black and shining; can see several acrostichals and five pairs of dorsocentral bristles; scutellum with one pair of large marginal bristles; front of thorax and front and lower part of pleura are dark yellowish brown to reddish brown, humeri a little more yellowish. Abdomen black with black hairs, first segment covered with brown pollen; hypopygium forming a rather large, rounded tip to the abdomen, covered with gray pollen and white hairs on posterior surface, its appendages small, reddish yellow.

Coxae black to dark reddish brown, anterior pair with black hair on outer anterior surface, longer delicate pale hairs on inner part, a row of five long, slender, black bristles on the edge of the tip; femora yellow, their extreme tips a little blackened; all tibiae and tarsi black; front femora with one large and one very small bristle near tip on lower posterior surface; front tibiae (Fig. 38) with a large bristle at basal third of upper anterior surface, a larger one beyond the middle on lower posterior edge, one at middle on anterior surface and one near tip on posterior edge, also a row of little golden yellow scales at tip; front basitarsi with three or four little spines below; middle tibiae (Fig. 39) with three large bristles on upper posterior surface, two on lower posterior edge of basal half and two near tip on upper and lower sides of posterior surface; their tarsi with rather long hair

on both upper and lower edges of posterior surface; middle femora with one large bristle near tip on lower posterior edge; hind femora bowed outward and with a large preapical bristle on anterior surface and a smaller one on posterior side; hind tibiae with four pairs of large bristles on upper surface, the last pair near tip; below with two small bristles nearly on middle third and a larger one at tip; all tarsi with more or less white hair; length of front tibiae as 60, middle as 90 and posterior as 105; joints of front tarsi as 33-14-11-8-10; of middle pair 44-19-15-10-10; of posterior pair as 30-32-14-8-7. Calypteres and their cilia black; halteres black, basal half of their petiole yellow.

Wings uniformly a little tinged with brown; third and fourth veins straight and nearly parallel beyond the cross-vein, apex of the wing between their tips; fifth vein straight for its whole length, last section as 40, cross-vein as 16; sixth vein strong, straight, but not reaching the wing margin; anal angle of wing rounded off, not prominent.

Female. Antennae, color of face, front and palpi as in the male; coxae, femora, tibiae and tarsi colored about as in the male, except that the basal half of hind femora is sometimes a little blackened; length of front tibiae as 60, middle as 85 and posterior as 124; bristles of front tibiae about as in the male, but much shorter; joints of front tarsi as 42-15-11-7-7; of middle as 40-18-14-8-8; of posterior pair as 30-30-16-9-7.

Holotype, male; allotype, female, and four female paratypes, all taken by F. X. Williams, January 17, 1932, on Kaala, Waianae Mts., Oahu, on boggy poollet, at 4,000 feet elevation.

The females, if all are correctly placed, sometimes have all femora almost wholly yellow; dorsum of thorax with two distinct reddish-brown stripes, extending their whole length, the humeri quite yellow and fore coxae sometimes dark yellow. There seems to be some variation in the bristles of front tibia, but usually they are about as in the male, except smaller, in the others some of the bristles may be broken off.

Campsicnemus octosetosus new species.

Male: Length 2.7 mm. Face rather narrow and dull black above, wider and brown below, lower part with yellow tomentum (or large scales of yellow pollen), a little irregular on lower edge; palpi and proboscis brown with hairs which appear pale in certain lights; antennae (Fig. 40) black, rather long, third joint a little longer than wide and somewhat rounded at tip; front blue-black, mostly shining; orbital cilia black.

Dorsum of thorax shining black, reddish in front and rather widely along the sides. prothorax reddish yellow with one large black bristle above each front coxa; pleura wholly reddish yellow, only a little darkened near the dorso-pleural suture; cannot see any acrostichal bristles; there seem to be four pairs of dorsocentrals, the anterior pair small; scutellum with one pair of large bristles and several small hairs near apical margin. Abdomen dull black, depressed, its hair almost wholly black; hypopygium concealed, tip of abdomen a little enlarged.

Front coxae almost wholly yellow, anterior surface with short black hairs, outer side with a few yellow hairs and tip with black bristles; middle coxae wholly black, posterior pair yellow or yellowish brown with posterior surface black, one black erect bristle on outer surface; trochanters black to yellowish brown; all femora yellow with black hair, those below rather short, posterior pair very narrowly black at tip; all tarsi wholly black; front tibiae (Fig. 41) yellowish, brown above, with two very long bristles below on middle third, two smaller ones on posterior surface and a small one at tip above, also a row of close-set, moderately long hairs on upper and lower edges of anterior surface, their hair wholly black; fore basitarsi with rather long hair on lower anterior edge and a large bristle at the middle; middle and hind tibiae blackish wiith basal third or more yellowish, the hair on their sides white; middle pair (Fig. 42) with four bristles above, three smaller ones on posterior side, one at tip below and two on lower anterior edge, one at basal and one near apical third; posterior tibiae with eight bristles above in two rows, three large ones on lower anterior edge, one near the middle, one at apical fourth, and one at tip; middle and hind tarsi plain, except that the middle basitarsi are slightly arched, concave below, hairs on middle pair largely and those on hind ones wholly white or yellow; length of front tibiae as 55, middle 90 and posterior as 94; joints of front tarsi as 36-15-10-8-8; of middle 35-20-14-9-7; of posterior pair as 24-26-14-9-7. Calypteres and their cilia black, halteres yellowish with a brown knob.

Wings tinged with brown; third vein slightly bent backward toward tip, last section of fourth vein straight, apex of wing between their tips; last section of fifth vein as 32, of cross-vein as 10.

Female: form of antennae and general color of body and legs as in the male; front tibiae above with a large bristle at basal third and one near tip; below with a large bristle at apical third; front basitarsi without a bristle but with long hair below; bristles of middle and hind tibiae about as in the male; abdomen with a few pale hairs on basal segments.

Holotype, male, and allotype, female, taken by F. X. Williams, November 29, 1931, at Kahana, Oahu, on water, at an elevation of 2,000 feet; ten paratypes were also taken at the same place and time.

Campsicnemus ornatus new species.

Male: Length 1.7 mm. Eyes contiguous, almost completely obliterating the face; palpi reddish brown with black hairs and a little white pollen; first antennal joint yellow (other joints missing in the type); front shining, dark green.

Dorsum of thorax and scutellum shining, bright green; pleura yellow; can see no acrostichal bristles and only two pairs of dorsocentrals (others may be broken off). Abdomen shining green with yellowish hairs, depressed; hypopygium mostly concealed.

All coxae, femora, tibiae and tarsi wholly yellow; front coxae with a few yellow hairs and bristles; front tibiae (Fig. 43) one and a half times as long as their basitarsi, without bristles or long hair, their basitarsi curved, concave below, with a row of long hairs above; middle tibiae (Fig. 44) without bristles, except a small one at tip above, anterior surface with quite

dense, delicate, long, yellowish hairs on most of basal third, these are bent at tip and are continued to tip of tibia by two rows of bristle-like hairs, which are very slightly thickened in the middle, lower surface with a row of rather widely separated, slender, erect hairs, which are longer than diameter of tibia; middle tarsi slender with rather long hair; hind tibiae above with one bristle at basal fourth, one near apical third and one near tip, no bristles below; length of front tibiae as 30, middle 55 and of posterior as 70; joints of front tarsi as 20-10-10-6-6; of middle as 30-16-11-9-8; and of posterior as 21-25-18-9-8. Halteres yellow.

Wings grayish, rather broad; third and fourth veins nearly straight and parallel, fourth ending in the apex of the wing; last section of fifth vein straight, its length as 24, cross-vein as 9; anal angle of the wing rather prominent.

Holotype, male, taken on the Hawaiian Islands.

This specimen was one of several that were glued on strips of paper and had become detached, so I cannot be sure on which Island it was taken. The second and third joints of front tarsi together measure 20, and the articulation of the joints is near the middle of this distance. It is partly hidden by the wing, so I have marked them as 10-10.

Campsicnemus sinuatus new species.

Male: Length 2 mm. Face very narrow above, a little wider below, dull brown, lower edge with yellow hairs; palpi black with whitish hairs; front and occiput black with bluish reflections on the former; antennae (Fig. 45) black, third joint long, acutely pointed at tip, arista basal with long pubescence; lower orbital cilia wholly black.

Dorsum of thorax and scutellum shining black, more or less reddish in front and on the sides, in holotype almost wholly reddish brown and paler on the sides; pleura largely yellow, black around the root of the wing; no acrostichal bristles; only two pairs of dorsocentrals; scutellum rather narrow at base, semicircular, the marginal bristles seem to have been broken off; humeri and propleura reddish brown. Abdomen black with black hair, a few pale hairs at base and tip; abdomen depressed, a little enlarged at tip; hypopygium mostly concealed.

Front coxae yellow, very narrowly black at base, with rather long and quite abundant yellow hair; middle and hind coxae black; fore and middle femora yellow with black hair, anterior pair nearly bare below, but with a row of a few very small black hairs on lower edge, moderately thick towards the base; middle femora greatly thickened at base (Figs. 46 and 47) with two rows of quite long, black bristles on basal third; hind femora yellow at base and more or less yellow at tip, black on the middle and mostly black above, with eight black bristles below on apical two-thirds, these are longer than width of femora; hind tibiae black, above with four bristles, one at basal seventh, one at basal two sevenths, one before fourth seventh, and one above and below at tip, all of these rather small; middle tibiae (Figs. 46 and 47) black, more or less yellow at base and on the sides, flattened and irregularly widened, widest at apical third, bisinuous, with two rows of

bristle-like hairs below, which are shorter on basal third, above with long hairs, a cluster of longer hairs on the widest part at basal third, these have their tips bent at a right angle, the tibia has a small conical projection below at basal third, and basal part of tibia (Fig. 48) has two projections, a square one at base and a rounded one a little beyond base; fore tibiae with two very small bristles below on middle third; all tarsi plain, black with rather short hair; length of front tibiae as 42, middle 54 and posterior pair as 72; joints of front tarsi as 23-12-10-6-6; of middle pair 27-14-9-8-6; of posterior pair as 17-16-11-7-7. Calypteres, their cilia and the halteres black.

Wings uniformly tinged with brown; third and fourth veins straight and parallel beyond the cross-vein, fourth ending just back of the apex of the wing; last section of fifth vein as 23, cross-vein as 10; first vein short, reaching only one-third its length beyond the forking of second and third veins; wings long and of nearly equal width, anal angle of wing rounded off, not at all developed.

Female: Third antennal joint but little longer than wide, triangular; thorax more black above than in the male, pleura reddish brown; femora and tibiae yellow, posterior tibiae more or less blackened towards tip, with about five bristles above on basal half and one below near apical third; length of middle tibiae as 55, they are plain with two bristles above and two below on middle third, all these bristles moderately long; all femora without long hair or bristles below, their hair largely yellow. Otherwise very much as in the male.

Holotype, male; allotype, female, and one male paratype were all taken by Swezey and Williams in October, 1931, at Nauhi Gulch, Hawaii, at about 5,000 feet elevation, on forest pools.

Campsicnemus spinitibia new species.

Male: Length 3 mm. Face rather narrow, brown with a little bright yellow tomentum on lower part, which is rounded below; palpi black with rather long black hair and one bristle at tip; front brown pollinose; occiput dull black; antennae black, third joint somewhat triangular, about as long as wide, arista basal, pubescent; orbital cilia wholly black.

Thorax black; acrostichal bristles in a single row in front, in two rows in the middle of the dorsum; there seem to be five pairs of dorsocentral bristles; scutellum with one pair of large marginal bristles; pleura wholly black. Abdomen black, its hairs mostly black, a few pale hairs on apical segments; hypopygium concealed, tip of abdomen thick, but not enlarged, with a row of short bristles on posterior margin of last segment.

Front coxae yellowish brown with stiff, rather long, black hairs; middle and hind coxae black; all femora yellow, their tips more or less blackened, middle and hind ones for a considerable distance, all with black, bristle-like hairs below, posterior pair with two preapical bristles, one beyond the other, the one nearest the tip smaller; all tibiae and tarsi wholly black; front tibiae (Fig. 49) with one bristle above and a longer one below; hair above rather long on tibiae and tarsi, a row of long hair below on tibiae and tarsi and a small bristle above and below at tip of tibiae; middle tibiae (Fig. 50) with four long bristles above, three on anterior surface, three on lower posterior edge and a small one above and below at tip, their femora with three

bristles near tip; middle tarsi plain with only moderately long hairs; hind tibiae with four large bristles above, last one near tip, two large ones on lower posterior edge of the third fourth, a small bristle below at tip and about four on anterior surface; hind tarsi (Fig. 51) with moderately long hairs below on all joints, those on last four joints bent at tip; length of front tibiae as 45, middle 87 and posterior as 85; joints of front tarsi as 23-12-10-6-6; of middle as 30-19-17-10-9; of posterior pair as 18-22-18-11-10. Calypteres, their cilia and the halteres black.

Wings blackish; third and fourth veins nearly parallel, apex of wings about half way between their tips; last section of fifth vein straight, its length as 45, cross-vein as 18; wing rather wide, anal angle rather prominent.

Female: A female taken with these males has the color of the wings, body and legs about as in the male, except that the lower part of the pleura is dark reddish brown; front tibiae yellowish brown and the front shining blue.

Holotype, male; allotype, female, and one male paratype were taken by Swezey and Williams in October, 1931, at Nauhi Gulch, Hawaii, at an elevation of about 5,000 feet. "On creek pool."

Campsicnemus strigosus new species.

Male: Length 1.5 mm. Eyes contiguous; front shining steel-blue; palpi small reddish brown; antennae (Fig. 52) yellow, tip of third joint blackish, arista dorsal with long pubescence; lower orbital cilia whitish.

Dorsum of thorax bright green, with a little brown pollen; two rows of acrostichal bristles; can see two pairs of dorsocentrals, one near the suture and one in front (back part of dorsum injured by the pin in type); lower part of pleura yellow. Abdomen green, darker than thorax, with yellow hairs and bristles, a few black hairs on lower edge of sides; hypopygium conspicuous, metallic black, rounded, with a pair of minute black, triangular lamellae on lower inner corner.

Fore coxae wholly yellow, nearly bare, but with several minute white hairs; middle and hind coxae seem to be black; all femora, tibiae and tarsi wholly yellow, last joint of tarsi scarcely darker; front leg (Fig. 53) with the femora of somewhat equal width, a little narrowed near the middle from below, apical half hairy, basal half nearly bare; tibiae very narrow in the middle, normal only at base and tip, fringed with long hairs above and below, their basitarsi much curved, larger at base and tip, with a dense fringe of long black hairs below, the upper edge less densely fringed; middle leg (Fig. 54) with the femora much thickened, except the narrow apical part, in some positions there seems to be a depressed brownish spot below before the thin part, which bears a cluster of spines; tibiae flattened and apparently twisted (as it changes shape when seen from different angles), fringed above with long delicate yellow hairs, below with five or six long, black, hair-like bristles on basal third, without stout bristles above or below, except the apical spurs, their basitarsi with long hairs above, which are continued on the following joint, fourth joint very slender, fifth slender at base, slightly widened at tip; hind femora rather thick, their tibiae slender, with several very slender bristles, the one above near basal fourth the longest, it being a little longer than diameter of tibia; tarsi slender, especially the last

two joints; length of front tibiae as 26, of middle 54 and of posterior pair 75; joints of front tarsi as 20-7-8-6-6; of middle pair 25-14-10-8-6; posterior pair as 20-23-16-9-6. Calypteres yellow, broadly black at tip with black cilia; halteres pale yellow.

Wings a little grayish, rather long and narrow, of somewhat equal width; third and fourth veins nearly straight and parallel beyond the cross-vein, fourth ending in the apex of the wing; last section of fifth vein straight, its length as 25, cross-vein as 9, perpendicular with fourth vein; anal angle of wing rounded, not prominent.

Holotype, male, taken May 4, 1913, by O. H. Swezey, at Waiawa, Oahu.

Campsicnemus tibialis new species.

Male: Length 2 mm. Face narrow above, a little wider below, dark dull brown, lower part about as long as wide, a little pointed below, white pollinose; palpi black with black hair and one long bristle; proboscis yellowish brown with black hair; front and occiput dull black; antennae (Fig. 55) black, third joint about as long as wide, arista basal, pubescent; orbital cilia wholly black.

Dorsum of thorax, scutellum and abdomen dull black, lower part of pleura yellowish, upper part black; four pairs of long, yellowish brown acrostichal bristles in two irregular rows; four dorsocentrals in a row; two scutellar bristles; prothorax with one large black bristle above each front coxa. Abdomen depressed with long, delicate pale hairs and some stiff black hairs on the middle of the dorsum; hypopygium mostly concealed, but apical end of abdomen a little enlarged.

Front coxae dark yellow, a little blackened at tip, with black, bristle-like hairs; middle and hind coxae black, latter with one large erect bristle on outer surface; all femora dark yellow, more or less blackened, especially at tip, their hair mostly black; front femora (Fig. 56) with black bristles below near tip and rather long black hair on the middle of lower surface, also a row of longer pale hairs; hind femora with rather long black hair below, ending in three bristles near tip of lower posterior edge; front tibiae (Fig. 56) yellowish brown with one bristle above near middle, below with a slender one near tip and on lower anterior edge a row of long pale hairs; middle tibiae (Fig. 57) black with a row of close-set, moderately long, black hairs on lower posterior edge, a row of long slender, nearly erect hairs on upper posterior surface and a row of about twelve long, slender, blunt bristles on basal two-thirds of lower anterior surface; hind tibiae (Fig. 58) black with five long bristles above and three shorter ones below on apical half, also a row of stiff black hairs on lower posterior edge; front basitarsi with hairs below, which are long at base, shorter towards tip; all tarsi black with rather long black hair; length of front tibiae as 48, middle 61 and posterior as 73; joints of front tarsi as 24-12-11-8-5; of middle as 33-17-12-9-8; posterior pair as 15-16-11-8-8. Calypteres black with yellowish cilia; knobs of halteres black, stem yellow.

Wings uniformly blackish; third and fourth veins straight and parallel, apex of wing between their tips; last section of fifth vein slightly arched, its length as 34, cross-vein 14; fork of second and third veins about opposite

middle of first vein; wing long and narrow, of nearly equal width, anal angle rounded, but a little prominent.

Female: General color about as in the male; antenna (Fig. 59); front shining, slightly metallic; face wholly black; all legs and feet with moderately long hair and bristles; fore femora and tibiae with their hair mostly yellowish; tibiae with a long bristle below and a smaller one above near the middle; middle and hind femora and tibiae with their hair mostly black, but middle tibiae with a row of yellowish hairs below; middle tibiae above with one bristle near basal fifth, a pair near second fifth and at tip one above and below; middle tibiae below with one bristle at basal fourth, one before the middle and one before apical fourth; hind tibiae above with one bristle at basal sixth, one at second sixth, one at apical two thirds, another a little beyond that and one near tip, none below; length of front tibiae as 54, of middle 82 and of posterior as 95; joints of front tarsi as 32-13-12-8-7; of middle 37-28-12-10-8; of posterior pair as 27-25-16-10-10; lower part of pleura yellowish; halteres yellowish; wings broader than in the male; fourth vein ending nearly in the apex of the wing; anal angle rounded off; last section of fifth vein straight, its length as 34, cross-vein as 18.

Holotype, male; allotype, female, and eleven paratypes, all taken by Swezey and Williams, October, 1931, in Nauhi Gulch, Hawaii, at an elevation of about 5,000 feet, on forest pools.

Campsicnemus williamsi new species.

Male: Length 2-3 mm. Face narrow, a little wider below with a little yellow pollen, lower part nearly round, covered with rather large scales of yellow, almost golden pollen; palpi black with long black hair; front shining blue-green; occiput black; antennae (Fig. 60) black, first joint long, third scarcely as long as first, its tip a little rounded, arista basal, long, pubescent; ocellar-tubercle prominent; orbital cilia wholly black.

Dorsum of thorax and the scutellum shining black, usually the sides of the dorsum a little reddish, sometimes broadly reddish on the sides and the lateral corners of the scutellum; I see one acrostichal bristle in one specimen, but most have none; there are three pairs of dorsocentrals and one pair of large scutellar bristles; prothorax with one large black bristle above each fore coxa; humeri usually reddish or yellowish brown; lower part of pleura reddish yellow to yellowish brown. Abdomen dull black with many small white hairs on the dorsum, depressed; hypopygium and last abdominal segment apically a little enlarged; hypopygium and its appendages mostly concealed.

Front coxae and all femora wholly yellow; hairs on fore coxae yellow; middle coxae black with abundant black hair on anterior surface; hind coxae yellowish brown with one small, erect, black bristle on outer surface; hairs on fore femora mostly yellow including the long ones below, but some of those at base are black at root, they have five small, hair-like, black bristles below near the base and one rather short, stout bristle near tip on lower posterior edge; middle and hind femora with their hair mostly black, as are also the slender bristles below; middle femora (Fig. 62) with a cluster of stout, black bristles below in the middle and a large hook at tip above, the size of this hook seems to vary in different individuals; hind

femora straight, not thickened, with about eight long, black, bristle-like hairs below on apical half and a large black bristle both above and below at apical sixth; hind tibiae black, upper surface with one bristle at basal sixth, one near basal fourth, one near basal third and one near the tip, below with a small bristle before basal sixth, a pair of small ones just beyond the middle and one at tip; middle tibiae (Fig. 62) black, flattened and widened irregularly, with a large cluster of very long hairs above beyond the middle, one very long bristle and two short ones on the side of apical third, besides other long hairs and bristles above and below; front tibiae (Fig. 61) yellowish brown, swollen near the middle and with long hair above and below, they have three very long, stout bristles above near the middle and three very long, but more slender bristles on posterior side of apical half; front basitarsi with long hair above and below, that above very long at base of joint; only moderately long at tip, this long hair is continued on the following joints, but is only moderately long; length of front tibiae as 50, middle tibiae 63 and posterior pair as 85; joints of front tarsi as 36-17-10-8-8; of middle pair 38-17-10-7-7; of posterior pair as 23-24-14-9-7. All tarsi black or brown. Calypteres, their cilia and the halteres black, sometimes the stem of the halteres is yellowish brown.

Wings uniformly tinged with dark brown, veins blackish; third and fourth veins straight and parallel, apex of wing between their tips; last section of fifth vein straight, its length in the large male as 32, cross-vein 15, in a small male the last section of fifth vein is as 27, cross-vein as 9; wings somewhat long and narrow, a little narrowed at base, but a little prominent at anal angle.

Female: Head parts and the wings as in the male, third antennal joint only a little shorter; color of body and legs as in the male, except that the lower part of the pleura is more brown, scarcely at all yellowish and the fore and middle femora are a little blackish above and below; length of front tibiae as 52, of middle 92 and of posterior 97; fore tibiae with one bristle above at basal two fifths and two at tip; one above and one below; middle tibiae above with one bristle a little before and one beyond the middle and one near apical third, below with one beyond the middle and one at apical third, also one above and one below at tip; hind tibiae above with one bristle at basal sixth, one beyond basal third and one at apical third, below with one beyond basal third and one beyond apical third, also one above and one below at tip; joints of front tarsi as 35-15-12-9-8; middle as 44-19-11-8-9; of posterior pair as 25-26-14-9-8.

Holotype, male; allotype, female, and five paratypes, taken by F. X. Williams, January 17, 1932, on boggy poollet on Mt. Kaala, Oahu, at 4,000 feet elevation, and five paratypes, taken November 29 and February 8, 1931, on poollets on Kahana ridge, Koolau range, Oahu, at 2,000 feet elevation.

Am naming this in honor of Dr. Williams, whose faithful work in collecting these interesting little flies has brought to light so many new forms of this genus.

Campsicnemus miritibialis new species.

Male: Length 2.4-2.6 mm.; of wing 3.5-4 mm. Face, front, palpi and proboscis black, face rather wide, a little narrowed in the middle; antennae black, third joint about as long as wide, conical in outline, arista as long as height of eyes; posterior orbits with a few black cilia above, a few pale hairs on the lower part of the black occiput.

Thorax and abdomen wholly black, somewhat shining, dorsum of thorax with a little brown pollen; acrostichal bristles in two irregular rows, very small; four pairs of dorsocentrals; scutellum with one pair of large marginal bristles; abdomen with black hairs; hypopygium partly visible, with a portion extending forward under the venter (this may be the lamellae), posteriorly near the dorsum is a small rounded part, covered with little black hairs, this is partly concealed, but I should take it for the outer lamellae if it was not for the part extending under the venter.

Legs and feet wholly black, except the fore coxae, all trochanters, extreme base of femora, and more or less of lower edge of front femora, which are usually yellowish brown; fore coxae with numerous long black hairs; fore femora rather wide, with long black bristles below on apical half, and a large preapical bristle on the side; middle femora wide when seen from the side, with two rows of moderately long bristles below; hind femora (Fig. 83) much widened when seen from the side, with two rows of long bristles below, seen from above (Fig. 80) much curved, concave posteriorly, and with long bristle-like hairs on both anterior and posterior edges of lower surface; fore tibiae (Fig. 81) with two large bristles above, near first and second thirds, and long, rather delicate hairs below; fore tarsi with fine, erect pile below, and long hair above; pulvilli large, almost concealing the claws in the drawing (Fig. 81). Middle tibiae (Fig. 82) very much widened, widest near apical third, where there are two long, pointed appendages above, beyond these the tibiae are much narrowed, but still much wider than normally found, they are fringed above and below with long hairs, several above near the points are longer than width of tibiae, near the tip is a yellowish brown lobe above, at apical end of this lobe is a short, thick, clavate or capitate appendage, below near the center are four long, erect bristles; middle tibiae with long white hairs on posterior surface, especially towards the apex, many of the hairs above also seem to be white; first joint of middle tarsi (Fig. 82) rather short, large, with an upturned horn-like tip, and a few long hairs above, second joint rather slender, attached to first near its base, on lower edge, this joint has fine, dense pile below, and long hairs above; third, fourth and fifth joints with moderately long hairs below and fine, dense, erect pile above, there are also a few long hairs above; hind tibiae (Fig. 83) with six bristles above and two below, besides the four bristles at tip, on basal two thirds they have a row of long, and more or less erect hairs, besides the usual recumbent hairs; hind tarsi (Fig. 83) with the base of last four joints narrowed, all joints with long hair above, below with rather long but scarcely erect pile, which is longest on first joint, the first two joints also have several slender, rather short bristles below; length of front tibiae as 51, of middle ones 64 and of posterior measured straight across about as 65, when measured on the curved side about as 80; length of hind tibiae as 88; joints of fore tarsi as 25-16-15-10-9; of middle tarsi, first joint from base to tip of point as 16, the following

joints as 25-17-12-10; joints of hind tarsi as 20-18-14-10-12. Calypteres, their cilia and the halteres black.

Wings blackish, rather long and narrow, but with the anal angle quite prominent; last section of fifth vein straight; last section of fourth vein slightly farther from third at its middle than at the cross-vein or tip, apex of wing between the tips of third and fourth veins; last section of fifth vein as 21, of cross-vein as 11.

Female: Almost like the male in color and the form of the wings, except that the fore coxae and base of fore femora are a little more yellowish; middle tibiae and tarsi plain; joints of fore tarsi as 30-13-8-6-10, of middle tarsi as 32-18-10-8-9; of hind tarsi as 30-18-16-11-12; front tibiae with one large bristle above and one below; hind femora bent about as in the male; all femora without large bristles below, but with a few rather long hairs on lower surface.

Holotype, male; allotype, female, and eight male paratypes and five female paratypes were taken by F. X. Williams, August 13, 1933, on running water at Waihi iki, Manoa, Honolulu, Oahu, and one female paratype was taken at Pauoa headwaters, Oahu, May 8, 1932, at an elevation of 1,400 feet.

Campsicnemus crinitibia new species.

Male: Length 1.8 mm.; of wing 2.3 mm. Face rather narrow, reddish, lower part nearly round, yellowish; cheeks reddish; palpi brown; proboscis black; front black with brown pollen; antennae (Fig. 84) black, third joint acutely pointed, with long pubescence; a few stout black orbital cilia above, and a very few pale hairs on the lower part of head.

Dorsum of thorax shining dark blue, scutellum blue-green with one pair of bristles, no acrostichal bristles; can see only two pairs of dorsocentrals; pleura blackish above, yellow on more than lower half. Abdomen black with greenish reflections; last segments on the sides, and the hypopygium with white hairs; hypopygium mostly concealed.

Coxae and femora pale yellow; fore coxae with a few small black hairs, especially on inner side of anterior surface; front femora with a few rather long hairs below; middle femora (Fig. 85) much widened on basal half or more, then narrowing to nearly normal, with a large protuberance below, before the tip, the widened basal half has many bristles on the flattened lower surface, which are arranged in four rows, the bristles in the two anterior rows are the longest and reach nearer to the protuberance than the shorter bristles in the two posterior rows; posterior femora only moderately thickened, with five bristles on lower surface, which are of decreasing length, with the longest near the basal third, and shortest near tip; fore tibiae with one bristle below near apical third, without bristles above; middle tibiae (Figs. 86 and 87) irregularly widened on apical two-thirds or more, and with a long thumb-like protuberance at base, rather dark yellow with a wide blackish ring near basal third on widened part; on basal third of lower surface there is a row of very short, stout spines, beyond these are rather slender, erect hairs; above with long delicate hairs where the tibiae widens, and beyond the middle a cluster of very long hairs, also a number of longer hairs near the tip; all tarsi plain; fore and middle knees

blackened; hind tibiae with about seven bristles on upper surface, below with rather long hair, and one small very slender bristle near the middle; length of front tibiae as 42, of middle pair as 53, and of posterior pair as 67; joints of front tarsi as 17-11-9-7-7; of middle pair as (Fig. 87) 27-13-10-8-8; of posterior pair as 20-18-12-7-6. Calypteres yellowish brown with black cilia; halteres pale yellow.

Wings grayish, veins brown; third and fourth veins parallel beyond the cross-vein; last section of fifth vein nearly straight, its length as 21, cross-vein as 9.

Holotype, male, taken by F. X. Williams, April 13, 1933, in the Kamokuiki Valley, Waianae Mts., Oahu, at 950 feet elevation, on water.

Campsicnemus nudifemorata new species.

Male: Length 1.5 mm. Eyes contiguous, leaving a black triangle below, which is a little white pollinose; antennae (Fig. 88) black, all three joints of nearly equal size, third joint rounded at apex, bare, arista slender with rather erect hairs, its tip lamelliform; front black, shining.

Thorax and abdomen shining black, without noticeable metallic color; hypopygium small, black.

Front coxae wholly yellow, but rather dark, with a few small black hairs, near the tip with rather long, hair-like bristles; middle and hind coxae blackish, broadly dark yellow at tip; femora, tibiae and fore and hind tarsi yellow; apical third of middle tibiae and their tarsi a little blackened, fore tarsi becoming brownish towards their tips, hind tarsi a little brownish apically; fore and middle femora nearly bare, without hair or bristles below or at tip on the sides; hind femora very thick, nearly straight, with a large bristle at apical sixth of posterior surface, without hair below; front tibiae without bristles, and with only short hair; first joint of fore tarsi with a row of bristle-like hairs below on whole length, these are of equal size and a little longer than the diameter of the joint; middle femora (Fig. 89) moderately thickened, narrowed before the tip; middle tibiae (Fig. 89) arched, concave below, and a little narrowed in the middle, with short hair, except on apical fourth of lower surface, and near the base above; first joint of middle tarsi (Fig. 89) very short, with a tooth above at base, and long hairs and bristles; second joint long, arched, concave above, with long hair above, and slender, erect, bristle-like hairs below, last three joints very short; hind tibiae with a row of nearly erect, rather long hairs on upper, anterior edge and two or three small bristles; length of front tibiae as 30, of middle pair 55, and of posterior pair as 59; joints of front tarsi about as 15-5-5-5-5; of middle pair as 7-30-5-4-4; joints of posterior pair as 11-20-8-7-6. Halteres blackish-brown. Wings crumpled in type.

Holotype, male, taken by F. X. Williams, August 13, 1933, at Waihi iki, Manoa, Honolulu, Oahu.

This is very much like *patellifer* Grimshaw, but the following characters given by Grimshaw differ from this specimen as mentioned in the above description: Front, dark brown; third

antennal joint hairy; halteres, bright yellow; abdomen, dull blackish brown; middle femora very much thickened on basal two-thirds with two rows of very conspicuous black bristles on the thickened portion, also two moderately sized bristles below near tip; first joint of middle tarsi with two long spines. The type is in poor condition, but as it differs in all these characters I do not think it can be the same species.

Campsicnemus bellulus new species.

Male: Length 1.5 mm. Face very narrow, linear on upper half, widening into the low part, which is nearly round and silvery white; palpi rather pale brown; front black with brown pollen; antennae black, third joint acutely pointed, about as in *crinitibia* (Fig. 84); lower orbital cilia pale.

Thorax and scutellum light yellow, pleura with a large blackish spot below the root of the wing; no acrostichal bristles; scutellum with one pair of large bristles; three pairs of dorsocentrals; bristles of the thorax black; abdomen black with black hair; hypopygium and its appendages black, mostly concealed.

All coxae, femora, tibiae and tarsi pale yellow, tarsi scarcely darker at tip; all femora almost whitish, hind femora with two small bristles near the tip on posterior surface, and a long one at apical fourth below, otherwise bare on lower half; middle femora (Fig. 91) moderately thick at base, with a small bristle on each side at tip, three long slender ones at base below, which are continued towards tip by shorter stout bristle-like hairs; fore femora with a small bristle near tip on posterior side, otherwise wholly bare on lower three-fourths; fore tibiae without noticeable bristles; middle tibiae (Figs. 90 and 91) thickened, irregularly widened, with a rounded protuberance at base, and long, rather stout, nearly erect, wavy hairs below, above with long fine wavy hairs on apical half, which are mostly yellow, and a moderately large bristle near tip; middle basitarsi (Fig. 91) with two little bristles above, at first and second thirds, otherwise the fore and middle tarsi are plain and slender; hind tarsi with first joint three-fourths as long as second, rather thick, each of the following joints becoming more slender than the preceding one; length of fore tibiae as 33, of middle pair 36, and of posterior pair as 55; joints of fore tarsi as about 16-9-8-5-6; of middle pair 38-14-11-8-7; of posterior pair as 15-21-7-6-7. Calypteres yellow with black cilia; halteres yellow.

Wings narrow, a little grayish, veins yellowish; third and fourth veins straight and nearly parallel beyond the cross-vein, but a very little farther apart at wing margin; fourth vein ending in the apex of the wing; last section of fifth vein slightly curved, its length as 19; cross-vein at right angles to fourth vein, its length as 6.

Holotype, male, taken by F. X. Williams, October 9, 1932, at Tantalus, Oahu, on a wet spot.

Campsicnemus divergens new species.

Male: Length 1.7 mm.; of wing 2 mm. Face and front black, eyes almost touching in the middle of the face, leaving rather long gray triangles

above and below; palpi black; first two antennal joints yellow, third brown, hairy, about as long as wide, obtuse at tip.

Dorsum of thorax and the scutellum greenish-black, a little shining; no acrostichal bristles; three pairs of dorsocentrals; scutellum with one pair of large marginal bristles; thorax with black bristles; abdomen blackish with green or bronze reflections, and black hair and bristles; hypopygium small, rounded posteriorly with several small bristles, but mostly concealed.

Coxae yellowish, femora and tibiae yellow, fore femora with a broad blackish ring near the middle, and a small bristle near the tip on posterior surface; fore tibiae without bristles, their apical third and their tarsi darker; middle femora (Fig. 92) with a bristle near tip on posterior side, bare below; middle tibiae (Fig. 92) with a pair of bristles near base, and one above and below beyond the middle, also one at tip below, their hair wholly short and recumbent; posterior femora bowed outward when viewed from above, with a bristle on each side near tip, nearly bare below, they are moderately thickened almost to their tip; hind tibiae with two bristles above, none below; all tarsi plain, except that the hind tarsi have first joint a little thickened and about six-sevenths as long as second joint; middle and hind tarsi scarcely darkened towards their tips; length of front tibiae as 32, of middle pair 50, and of posterior pair as 66; joints of fore tarsi as 32-8-7-4-6; of middle pair as 25-13-9-7-6; of posterior pair as 18-21-13-9-6. Calypteres blackish, with a few pale cilia; halteres pale yellow.

Wings grayish, rather narrow; third and fourth veins nearly straight from the root of the wing, distinctly divergent, the apex of the wing between their tips; last section of fifth vein nearly straight, its length as 30, cross-vein as 10.

Female: Almost like the male in color and form, but the third antennal joint seems to be more yellow, third and fourth veins are slightly less divergent and front femora and tibiae wholly yellow.

Described from ten specimens, taken by Swezey and Williams, September 30, and October 1-3, 1931. Holotype, male, and allotype, female, taken October 1, 1931, in Nauhi Gulch, at 5,000-6,000 feet elevation. All were taken in Nauhi Gulch. Those labeled October 1st were swept from the foliage of Broussaisia, and those taken October 2 were swept from the foliage of lehua (*Metrosideros*), by O. H. Swezey.

This comes nearest to *rectus* Malloch, but differs as in the table of species.

Table of Species of Campsicnemus Known to Be Found in the Hawaiian Islands.

1. Femora, tibiae and tarsi black..... 2
   Femora and usually the tibiae yellow, or mostly yellow..... 3
2. Middle tibiae not, or scarcely widened, with a row of slender, blunt bristles on the side (Kokee, Kauai Island).....*nigricollis* Van Duzee

Middle tibiae greatly widened, with a pair of acutely pointed horns on upper surface, near apical third; middle basitarsi short, thick, with an upturned, horn-like point at tip, second joint inserted near its base on lower surface (Oahu) ..... *miritibialis* Van Duzee

3. Arista plain as usual 4
   Arista with a lamella at tip 25
4. Upper surface of front tibiae with three bristles, which are as long as the front basitarsi, these basitarsi have very long hair at base, which becomes shorter towards their tips; middle tibiae with very long, dense hair above; middle tibiae with a large hook at tip (Oahu) ..... *williamsi* Van Duzee
   Only middle tibiae with unusually long hair or bristles, and often their hair and bristles only moderately long 5
5. Middle tibiae with a rounded projection near base 6
   Middle tibiae without a projection at base 10
6. Middle tibiae with about five very long, curved, stout bristles at their apex, the tip of the tibiae extending beyond the base of their tarsi (Oahu) ..... *gloriosus* Van Duzee
   Middle tibiae without long bristles at their tips, their tarsi attached to the tip of the tibiae as usual 7
7. Middle tibiae widened, very crooked and sinuous, with long hair on the edges, especially on upper apical half (Hawaii) ..... *sinuatus* Van Duzee
   Middle tibiae a little arched, not or but little sinuous 8
8. Middle tibiae gently bent, not widened, rather slender, fringed with moderately long hairs below, which are twice as long as the diameter of tibia; third antennal joint longer than wide, obtusely pointed at tip (Hawaii) ..... *grimshawi* Van Duzee
   Middle tibiae a little concave, below, considerably widened on apical two-thirds or more; third antennal joint long, acutely pointed at tip 9
9. Middle tibiae of somewhat irregular outline, but of nearly equal width on apical three-fourths, and with a conspicuous cluster of long hairs above, beyond the middle, also with hairs not as long on upper surface, especially near base and tip, middle basitarsi without bristles; basal half of middle femora very much thickened (Oahu) ..... *crimitibia* Van Duzee
   Middle tibiae seen from the side, evenly rounded below on apical two-thirds, with rather long hair on both upper and lower edges, and a bristle above near tip; viewed from above, the middle tibiae widening towards the tip, narrowing abruptly a little before the apex, with long hair on the edge on widest part, a few bristle-like hairs on the other side; middle femora moderately widened at base, and with three moderately long bristles near base below; middle basitarsi with two small bristles above (Oahu) ..... *bellulus* Van Duzee
10. Middle tibiae widened or thickened 11
    Middle tibiae not or scarcely widened, thickened or flattened 15
11. Antennae black 12
    Antennae yellow, or reddish yellow, at least mostly yellowish at base .. 13
12. Middle tibiae greatly widened in the middle, somewhat fusiform; middle tarsi with long hair below, first joint longer than second (Oahu) ..... *ciliatus* Van Duzee

Middle tibiae much widened, with a small hook at tip below; first joint of middle tarsi about twice as long as wide, shorter than second, and with two fine hair-like bristles below (Oahu) ..... *brevipes* Van Duzee

13. First joint of middle tarsi greatly widened, leaf-like, about twice as wide as long, shorter than second, and with a bristle on one side; middle tibiae with apical part much widened, very thin and twisted (Hawaii) ..... *distortipes* Grimshaw

First joint of middle tarsi not leaf-like; apical part of middle tibiae not widened, twisted or very thin 14

14. Fore tibiae short, about as long as the basitarsi, slender, especially in the middle; middle basitarsi bent in nearly a quarter circle, a little enlarged at extreme base; first joint of middle tarsi twice as long as second, plain (Oahu) ..... *strigosus* Van Duzee

Front tibiae normal, much longer than their basitarsi; middle tibiae slightly thickened on apical third, with fine hairs, mostly erect, above, and a bristle on each side near apex; below with a group of black, short bristles, in three rows near apical third; middle basitarsi slightly curved, not half as long as second joint, the anterior dorsal angle slightly produced, and tipped with a curved, black thorn; bristles of thorax yellow (Hawaii) ..... *congregatus* Malloch

15. Middle tibiae with a row of long, slender, blunt bristles on one side (Hawaii) ..... *tibialis* Van Duzee

Middle tibiae without a row of blunt bristles 16

16. Middle basitarsi shorter than the following joint, with an erect spur at tip; middle tibiae with a row of very short, erect bristles or spines below, and a row of longer bristles or bristle-like hairs above on their whole length; third antennal joint brown, basal joints paler (Molokai Mts., Molokai) ..... *calcaratus* Grimshaw

First joint of middle tarsi longer than second, or not much shorter 17

17. Antennae wholly yellow, or with the first joint yellow 18

Antennae wholly black, or dark brown 22

18. Middle tibiae slightly curved, with four large bristles above, below with about ten longer bristle-like hairs, or slender bristles (Hawaii) ..... *fimbriatus* Grimshaw

Middle tibiae above with a pair of bristles near base and one beyond the middle, below with one bristle beyond the middle and one at tip, no erect hairs or bristles below; hind tarsi with first joint six-sevenths as long as second; antennae yellow with third joint brown (Hawaii) ..... *divergens* Van Duzee

Middle tibiae with one bristle above near base, besides those at tip .. 19

19. Hairs and bristles of the thorax yellowish; antennae yellow; middle tibiae with a rather strong, black bristle close to the base on anterior surface, and a short spine on lower anterior surface near tip; middle tarsi with second joint six-sevenths as long as first, and with a straight, forward-directed, brownish spur at tip (Oahu) ..... *inermipes* Malloch

Hairs and bristles of thorax black 20

20. Middle tibiae with a series of short, erect, delicate hairs on lower posterior surface, and a short bristle above near base on anterior edge; third antennal joint brownish; hind basitarsi three-fourths as long as second joint (Oahu) ..... *rectus* Malloch

Middle tibiae with a rather close row of long, blunt hairs either above or below; first joint of hind tarsi three-fourths as long as second.... 21

21. Front basitarsi arched, concave above, with rather long hairs below; middle tibiae with small, slender, erect spines above on basal two-thirds, arched, concave above, lower surface with a row of long, delicate hairs, of nearly equal length, which have their tips bent; tarsi plain (Oahu).....*ornatus* Van Duzee

Front basitarsi slightly arched, concave below, a little enlarged at base; middle tibiae straight with a bristle near base above, and three at tip, a row of long, fine hairs of nearly equal length on the whole of upper surface, these hairs have their tips bent; middle basitarsi straight, with about sixteen long, slender, curved hairs above (Oahu).....*flavicornis* Van Duzee

22. Middle tibiae above with about seven bristles, in two rows, also two or three large bristles below..... 23

Middle tibiae with three or four bristles above, one of which is at the tip, and one at tip below, sometimes there are two or three more bristles below near the middle..... 24

23. Front tibiae without a bristle above, somewhat concave on dorsal edge, below with a large bristle near the middle, and a small one near tip; hind femora flattened, wide when seen from above, much curved, concave below when seen from the side; middle tibiae on upper surface with about five bristles on anterior surface, and two on posterior edge of basal half, below with two bristles on middle third (Oahu).....*concavus* Van Duzee

Front tibiae nearly straight, with a bristle above before the middle and one below beyond the middle; hind femora nearly normal; middle tibiae with two rows of bristles above, one of four and the other of three bristles, below with three large bristles, near first, second and third fourths (Hawaii).....*spinitibia* Van Duzee

24. Front tibiae with two large bristles on middle third of lower surface, two small ones on posterior surface, and one above at tip; front basitarsi with one bristle near the middle on posterior surface; middle tibiae with four large bristles above, one of which is at tip, one bristle at tip below, and three on posterior side, which are rather small, also two small bristles on lower anterior edge; posterior tibiae with eight large bristles above, in two rows, three large bristles on lower anterior edge, one at basal and one at apical fourth, the other near the middle, also one at tip below (Oahu).....*octosetosus* Van Duzee

Front tibiae with one large bristle above at apical third of posterior edge, a larger one at basal third of upper anterior edge, and a still larger one beyond the middle of lower surface, also one at tip on posterior surface; fore basitarsi with three small spines below; middle tibiae with four large bristles above, one of which is at the tip, two on lower posterior edge of basal half, two near basal third below, and one at tip below; third antennal joint about as long as wide, rounded at tip (Oahu).....*obtusus* Van Duzee

25. Third antennal joint hairy; middle femora greatly thickened on basal two-thirds, with two rows of large, black bristles below on thickened portion; halteres bright yellow (Oahu).....*patellifer* Grimshaw

Third antennal joint bare; middle femora only moderately thickened, wholly bare below, without hair or bristles; halteres wholly black (Oahu) ..... *nudifemorata* Van Duzee

Syntormon distortitarsis new species.

Male: Length 2.5-3 mm. Face narrow, silvery white; front broad, violet or violet-blue, shining; occiput nearly opaque with brown pollen; antenna (Fig. 63) black, third joint long, tapering into a long narrow point; second joint extending thumb-like over third on inner side for nearly the length of first joint, arista apical, a little shorter than third joint; palpi and proboscis black; orbital cilia black, a few of the lower hairs brown.

Dorsum of thorax and the scutellum green with slight blue reflections, sometimes wholly blue, dorsum dulled with brown pollen; acrostichals large, in a single row, ending in a pair just before the depressed posterior slope of thorax; six dorsocentrals in each row; one large and two small humeral bristles, two posthumeral, two presutural and one superalar bristle, scutellum with one pair of large marginal bristles and a pair of small hairs on the margin near base; prothorax with short white hairs above front coxae; pleura mostly black, white pruinose, a little green on anterior part; abdomen green or blue, white pollinose, incisures and hairs black, sometimes the sides and one or two of the incisures yellow; hypopygium (Fig. 64) large for the genus, metallic, its appendages conspicuous and black.

Fore coxae yellow, dark at base with white hair and one black bristle; middle and hind coxae black; middle coxae with white hair and one black bristle on anterior surface, hind ones with one black bristle on outer side; trochanters, femora, tibiae and basitarsi yellow, sometimes whole of fore and middle tarsi yellow; sometimes hind tibiae and tarsi brown or blackish, only a little yellowish at base of tibiae; front and posterior femora with one, middle femora with two preapical bristles, the outer one on middle femora slender; all femora nearly bare below; fore tibiae with stiff hairs above and one bristle near basal third, below with one bristle near middle; middle tibiae with one bristle above near middle; hind tibiae with four bristles on upper posterior edge and quite dense, rather long hairs on both lower anterior and posterior edges, especially on apical half; fore tarsi (Fig. 65) with tip of first joint enlarged and fifth a little widened; hind tarsi (Fig. 66) with first joint thick and with a bristle at tip, second joint with basal part short and with a thumb-like projection on one side nearly as long as basal part and extending nearly parallel with third joint, bearing many stiff, black, curved hairs; length of front tibiae as 48, of middle 73 and of posterior as 90; joints of fore tarsi as 26-13-11-6-7; of middle as 35-17-12-7-7; of posterior pair as 22-12 over all (basal part 6, projection 7)-8-8. Calypteres yellow, sometimes brownish with yellow cilia, which has the base of the bristles more or less black; halteres pale yellow.

Wings gray, slightly brownish in front, rather long and narrow, widest at the posterior cross-vein, anal angle of wing a little prominent; third vein bent backward at tip, where it approaches fourth a little; last section of fourth vein nearly straight, ending in the apex of the wing; last section of fifth vein nearly straight, its length as 21, cross-vein as 16.

Female: Face wide, blue with only a little white pollen; lower edge considerably projecting; antenna (Fig. 67) small, third joint nearly round, very slightly angled at tip, arista subapical, nearly twice as long as antenna;

orbital cilia black; all femora yellow; color of thorax, its bristles and the color of abdomen about as in the male; wings as in the male; fifth joint of fore tarsi slightly widened; joints of fore tarsi as 29-15-10-7-7; of middle 39-16-11-7-8; of posterior pair as 23-23-17-10-9. Calypteres black, their cilia mostly black.

Described from eight males and twelve females. Holotype, male, and allotype, female, were taken by F. X. Williams, July 24, 1932, in Hering Valley, Tantalus, Oahu, the male hovering over the female, on wet rocks; two male and six female paratypes were taken at the same place and time; one pair of paratypes at Mana, Kauai, March 9, 1917, by O. H. Swezey; one male, three females at Honolulu, Oahu, on windows, by O. H. Swezey; and one pair at Pauoa headwaters, Tantalus, Oahu, February 14, 1932, at 1,400 feet elevation, by F. X. Williams.

The antenna in this species is formed a little like those of the European *pallipes,* but the hind tarsi are very different. I know of no described species of Syntormon with the second joint of hind tarsi modified as in this form.*

It is a little like the genus Pycsymnus Frey, but that genus seems nearer related to Sympycnus, agreeing with Syntormon in having the hind tarsi modified, but the first joint very short in the male, and an apical arista. All known species are from Formosa and the Philippine Islands.

EURYNOGASTER new genus

A new genus of Sympycninae; differing from Sympycnus in having the cross-vein longer than the last section of fifth vein; the abdomen of both sexes depressed when seen from above, in the male the abdomen is more or less clavate or widened below before its tip, in the female the abdomen is rather pointed when viewed from above or from the side, and the posterior part of the thorax has a conspicuous depressed and somewhat concave area before the scutellum.

Face of male rather wide, that of female only a little wider; first antennal joint bare above; third joint something like that of Sympycnus, arista dorsal, nearly bare or slightly pubescent. The depressed area on posterior part of thorax distinctly concave and large; no acrostichal bristles; five pairs of large dorsocentrals; scutellum with one pair of large marginal bristles. Abdomen in the male seen from the side (Figs. 69, 71 and 74) clavate, or conspicuously widened below at posterior margin of fourth or fifth segment; sixth segment small, seventh very narrow, but visible; hypopygium concealed or more or less conspicuous. Wings with the first vein reaching half way from the root of the wing to the cross-vein; third and

* It comes nearest to *flexibilis* Becker from Formosa, but that species has the third antennal joint very small, pear-shaped with a subapical arista; first joint of hind tarsi rounded below, widest in the middle, and second joint extending but little beyond base of third joint.

fourth veins approach each other very slightly beyond the cross-vein, but are parallel at tip; cross-vein a little longer than the last section of fifth vein in the males, but in the female the cross-vein is a little shorter than the last section of fifth vein; sixth vein represented by a slight fold of dark coloring in the wing membrane where the base of the vein should be; middle and hind femora with one preapical bristle; hind coxae with a large, erect bristle on outer surface; first joint of hind tarsi a little longer than second joint.

Type of genus *Eurynogaster clavaticauda* new species.

Table of Hawaiian Species

1. Hypopygium conspicuously projecting, almost free, extending downward and a little forward; fourth abdominal segment widened below (Figs. 71 and 72) ..... *nitida* new species
   Hypopygium small, partly or wholly concealed 2
2. Fifth abdominal segment greatly enlarged, abdomen strongly clavate when seen from the side; face long, extending below the lower margin of the eyes (Figs. 68, 69 and 70) ..... *clavaticauda* new species
   Fifth abdominal segment moderately widened below; face scarcely reaching lower margin of the eyes (Figs. 73 and 74) ..... *virida* new species

Eurynogaster clavaticauda new species.

Male: Length 2.1 mm. Face silvery white, moderately narrow with its sides nearly parallel on lower three-fourths, slightly wider above, nearly six times as long as width of middle, its suture near apical fourth, lower part twice as long as wide, rounded below, reaching below lower margin of eyes and to the middle of the palpi; front green, with brown pollen; palpi and proboscis black; antennae (Fig. 68) black, first joint without hair above, second rather large with small bristles on apical margin, third joint about one and a half times as long as wide, arista dorsal, not quite twice as long as the antenna, both antenna and arista nearly bare; the orbital cilia seem to be wholly black.

Dorsum of thorax blue-green, shining, but with brown pollen, the large depressed, slightly concave area before the scutellum and the scutellum blue; no acrostichal bristles; five pairs of dorsocentrals, scutellum with one pair of very large marginal bristles; pleura black with some green reflections; posterior part of thorax below the abdomen pale yellow. Abdomen bronze-green with black hair, seen from above it is depressed and somewhat pointed at tip, seen from the side (Fig. 69) greatly enlarged below at posterior margin of fourth segment; sixth segment small, seventh very narrow; hypopygium reddish brown, its appendages largely concealed, black, fringed with short hairs.

Front coxae reddish brown with a few black hairs on anterior surface and five bristles at tip; middle and hind coxae reddish brown to black, their tips more or less yellow; posterior pair with one large, erect bristle on outer surface; all femora and tibiae yellow, tips of posterior tibiae enlarged and somewhat blackened; tarsi yellow, more or less darkened from tip of first joint; fore femora with a rather small bristle below near tip, middle and hind femora each with a rather large preapical bristle, middle ones also with a row of bristles below; front tibiae with a small bristle above near basal fourth, none below; middle tibiae (Fig. 70) with several large bristles below near the middle, which are continued nearly to base and tip by smaller

ones, above with one large bristle near basal third and one near the middle, also three at tip; hind tibiae above with a pair of long bristles at basal fifth and one large one near apical third, tips with three bristles; length of fore tibiae as 50, of middle pair 53 and posterior pair as 96; last joint of all tarsi a little flattened and widened; joints of fore tarsi as 29-15-11-8-9; of middle ones 41-21-16-9-7; posterior pair as 30-23-17-10-10. Calypteres yellow with black cilia.

Wings grayish hyaline; first vein reaching half way from root of wing to the cross-vein, which is beyond the middle of the wing; third vein bent back a very little towards its tip, so as to slightly approach fourth at tip; last section of fourth vein nearly straight, except that it bends back a little to meet the cross-vein, ending a little back of the apex of the wing; last section of fifth vein straight, its length as 19, cross-vein a little arched, so as to be a little convex towards apex of wing, its length as 21; anal angle of wing rounded off, not at all prominent.

Female: Face a little wider and slightly shorter than in the male; the rest of the head and the thorax about as in the male; abdomen depressed, tapering to the tip, which is rather pointed when seen from above or from the side, its hair black, or mostly black, tip of abdomen with a few rather long, bristle-like hairs; all coxae black with black hairs and bristles; fore tibiae with a bristle at basal third; middle tibiae with a bristle above at basal fifth and one below before the middle; hind tibiae about as in the male; fore and hind tibiae without bristles below; length of fore tibiae as 53, of middle pair 68 and of posterior pair as 88; joints of fore tarsi as 30-17-12-8-8; of middle pair 46-23-12-10-8; of posterior pair as 35-29-17-9-8. Halteres yellow, knobs darker yellow; wings about as in the male, except that the cross-vein is as 18 and last section of fifth vein is as 23.

Holotype, male, and allotype, female, were taken by O. H. Swezey, May 18, 1920, on Mt. Kaala, Oahu; three paratypes were taken at the same time and place.

Eurynogaster nitida new species.

Male. Length 2.3 mm. Face wholly white pollinose, rather wide above, half as wide at lower margin of eyes as at the antennae, extending considerably below the eyes, its suture rather indistinct, but upper part about two and a half times as long as the lower portion, which is rounded below; front green, somewhat dulled with grayish brown pollen; palpi black, moderately large with pale hairs; proboscis and first two antennal joints black (third joint broken off in type); first joint bare above; can see only a few small black orbital cilia on lower half of posterior orbits.

Dorsum of thorax, scutellum and abdomen shining green, with slight blue reflections; no acrostichal bristles; five pairs of moderately large dorsocentrals; scutellum with one pair of large marginal bristles, there are also several very small hairs on the margin; posterior part of thorax with a conspicuous concave area before the scutellum; hairs on the abdomen yellowish, one or more black bristles on posterior margin of each segment near lower edge; seen from the side the abdomen (Fig. 71) is widened below at the posterior edge of fourth segment; fifth segment rapidly narrowed apically; sixth segment small; seventh very narrow; hypopygium large, brown, extending far beyond seventh segment, its base extending nearly to base of

fifth abdominal segment; outer lamellae black with a spine-like tip and delicate hairs.

Front coxae yellow with several small black hairs on inner edge of anterior surface and three small bristles at tip; middle and hind coxae black, former with black hair, the latter with one large, black, erect bristle on outer side; all femora, tibiae and tarsi pale yellow, hind tarsi a little blackened towards tip; fore femora with a small, middle and hind femora with one large preapical bristle; middle femora (Fig. 72) with a large bristle below before its middle and beyond this five smaller bristles; fore tibiae with a small bristle above near basal third, none below; middle tibiae with one large bristle above near basal fifth and two smaller ones at tip, below with a row of long hairs, the longest near basal third and decreasing a little in length towards tip; hind tibiae with two large bristles above, one near basal third and one beyond the middle, two bristles at tip, one above and one below, no bristles below except the one at tip; length of front tibiae as 42, of middle 62 and of posterior as 65; joints of front tarsi as 26-14-11-6-7; of middle pair 37-20-16-7-6; of posterior pair as 29-24-14-10-7. Calypteres and their cilia dark yellow; halteres blackish.

Wings grayish; first vein scarcely reaching half way from root of wing to cross-vein, which is beyond the middle of the wing; third and fourth veins slightly convergent beyond the cross-vein, parallel at tip, fourth ending in the apex of the wing; last section of fifth vein straight, its length as 13, cross-vein bent outwards, so as to be convex towards apex of wing, its length as 18; sixth vein represented by a slight fold in the wing membrane where its base should be; anal angle of wing rounded off, not at all prominent.

Holotype, male, taken by O. H. Swezey, April 29, 1920, at Kaumana, Hawaii. Type in rather poor condition, having been eaten by museum pests.

Eurynogaster virida new species.

Male: Length 2.2 mm. Face rather wide, its sides nearly parallel, but widened a little on upper third; wholly white pollinose, reaching nearly to lower margin of the eyes, its suture near apical third, lower portion as long as wide, rounded below; front green, dulled with grayish brown pollen; palpi black with pale hairs; proboscis thick, black; antennae (Fig. 73) black, first joint bare above, third about as long as wide, tip rounded, arista inserted near middle of upper edge, where there is an offset on upper margin, arista short pubescent.

Thorax, scutellum and abdomen bright shining green with some bronze reflections; thorax with a little grayish pollen and a conspicuous depressed, somewhat concave area before the scutellum; no acrostichal bristles; five pairs of dorsocentrals; scutellum with one pair of marginal bristles; abdomen with black hair, seen from above it is depressed, seen from the side (Fig. 74) with fifth segment widened at apical margin below; fourth segment also a very little widened apically; seventh segment very narrow, mostly concealed; hypopygium concealed, but with a pair of lamellae projecting from the hollowed posterior apex of the abdomen, these are mostly black and fringed with long delicate pale hairs.

Fore coxae yellow, middle and hind coxae black, posterior pair with a large black erect bristle on outer surface; all femora, tibiae and tarsi yellow, last joint of fore tarsi brown, middle and hind tarsi a little darkened towards their tips; fore femora without bristles; middle femora with one large preapical bristle; hind femora bowed outward when seen from above, with a preapical bristle, which is placed near apical third; front tibiae with a small bristle above near base; middle tibiae above with three bristles near basal fifth and one near basal two-fifths; upper surface of posterior tibiae with one moderately large bristle near basal fourth, a small one near three-fourths their length, besides these there are several at tip; middle basitarsi with a row of little bristles below, which are as long as diameter of joint; first joint of hind tarsi with a rather large bristle at tip; length of fore tibiae as 68, of middle pair 85 and of posterior pair as 100; joints of fore tarsi as 44-28-18-10-7; of middle pair as 50-31-19-12-6; and of posterior pair as 40-37-21-12-8. Calypteres yellow with black tip, their cilia partly yellowish and partly black; knobs of halteres yellow, stem black.

Wings grayish; third and fourth veins slightly convergent beyond the cross-vein, but parallel at tip, fourth ending in the apex of the wing; last section of fifth vein straight, not reaching the margin of wing, its length to wing margin as 13, cross-vein as 22; sixth vein represented by a dark shade where its base should be; anal angle rounded off, not at all prominent.

Holotype, male, taken by O. H. Swezey, May 18, 1920, on Mt. Kaala, Oahu.

Medetera hawaiiensis new species.

Male: Length 2.3 mm. Face, front, palpi and occiput black, with a little gray pollen; face moderately wide, slightly narrowed in the middle; antennae black; third joint about as long as wide, conical in outline, arista apical, with very short pubescence; upper orbital cilia black, lower part of occiput with several whitish hairs.

Dorsum of thorax and the scutellum black, with a little white pollen; bristles and hairs of the thorax black; acrostichal bristles in two distinct rows; can see but two pairs of dorsocentrals; prothorax with one black bristle and a black hair above each fore coxa; scutellum with one pair of large marginal bristles, placed rather far apart. Abdomen black, with abundant white hairs on the dorsum; hypopygium black, almost glabrous, with a few little white hairs on the side, its appendages are a little yellowish brown.

Coxae and basal part of femora black, apical part of femora, the tibia and tarsi yellow; femora with short hair, no long hairs below; middle tibiae with a very small bristle near base; tarsi a little darkened towards their tips; length of front tibiae as 45, of middle the same, of posterior as 51; joints of fore tarsi as 23-17-12-7-7; of middle tarsi as 35-18-13-6-4; of posterior pair as 15-30-16-9-7. Calypteres yellowish brown with white cilia; halteres black.

Wings grayish hyaline, veins yellowish, brown towards the apex of wing; venation about as usual in the genus; last section of fifth vein as 17, cross-vein as 13.

Holotype, male, taken by Swezey and Williams, October, 1931, at Nauhi Gulch, Hawaii, at an elevation of between 5,000-6,000 feet.

Medetera atrata new species.

Male: Length 2 mm. Face wholly shining black; front dull black; antennae black, third joint scarcely longer than second, somewhat rounded, arista black, subapical, very short pubescent; upper orbital cilia black, a few of the lower cilia white.

Thorax black; dorsum thickly covered with greenish-gray pollen, the pollen on the sides of middle third more yellowish gray, a broad reddish brown, median stripe has a row of acrostichal bristles on each edge; two or three pairs of dorsocentrals; two pairs of scutellar bristles; prothorax with two white bristles above each front coxa; hairs on front part of thorax black with a few yellow ones on the front slope. Abdomen black with white pollen and with white hairs, on the dorsum long and abundant; hypopygium wholly shining black, the usual white pollinose space on the left side, which is covered with small white hairs; hypopygium thick and moderately long its lamellae blackish brown with a slight reddish tinge.

Coxae and trochanters black, posterior coxae with one erect white bristle on outer surface; all femora reddish brown to yellowish brown, more or less blackened at base; tibiae and tarsi yellow; all femora nearly bare below with a few yellowish white hairs on the sides and above, posterior pair with a few long, yellowish, stiff hairs at base above; hairs on the tibiae and tarsi of hind feet wholly yellowish white, on fore and middle tibiae and tarsi black above, yellowish white on lower part; anterior and posterior tibiae without bristles, middle tibiae with one rather small black bristle on upper posterior edge at basal sixth; length of fore tibiae as 53, of middle as 62; joints of fore tarsi as 21-21-14-7-7; of middle as 40-24-17-9-5; of posterior pair as 17-40-21-9-8. Calypteres reddish brown with white cilia; halteres dark yellow almost reddish brown.

Wings nearly hyaline, veins yellow; third and fourth veins convergent; last section of fifth vein as 16, cross-vein as 13; posterior margin of wing evenly rounded, anal angle rounded, not prominent.

Female: Color, form of wings and tarsi about as in the male; fore coxae with white hair; face bluish-green; femora colored about as in the male.

Described from one male and two females, taken by Swezey, August 7, 1924, at Honolulu, Oahu.

This differs from *cilifemorata* new species by having the first and second joints of fore tarsi of equal length, femora darker in color; hypopygium wholly shining black, its lamellae blackish and the face of the male shining black.

Medetera cilifemorata new species.

Male: Length 2 mm. Face below the suture dark blue-green, above opaque with grayish brown pollen; front mostly grayish brown; occiput black with grayish pollen above, shining black below; antennae black, third joint small, rounded, sometimes a little notched at tip where the arista is inserted, arista yellowish brown with very short pubescence; orbital cilia white, a few above black; palpi black with white pollen and yellow hairs.

Dorsum of thorax green, thickly covered with gray pollen, usually with a rather broad, brownish, medial stripe, in which the two rows of acrostichal

bristles are inserted, these bristles are reddish yellow when seen in certain lights, black when viewed from other angles, the hairs on fore part of thorax are of the same color; there are two pairs of long posterior dorsocentral and two small ones near the middle of the thorax, and are then continued to the front of the dorsum by small hairs; there are two humeral, one posthumeral, one presutural, two superalar, one postalar and two notopleural bristles; scutellum with two pairs of stout but not very long marginal bristles; prothorax with two white bristles above front coxae, the upper one slender. Abdomen green with white pollen and hair, some of the hairs on the sides appear black; hypopygium large at base, of moderate length, in the holotype shining black, except at tip where it is reddish yellow below, in the paratypes it is more largely yellowish or reddish yellow, its lamellae yellow with white hairs.

All coxae and trochanters black, fore and middle ones with white hair, hind ones with one erect, white bristle on outer side; all femora, tibiae and tarsi wholly yellow; hairs on fore and middle femora and tibiae mostly black, on lower part of middle tibiae the hairs are yellow; hairs on hind femora yellow including the row of long ones above, at base of femora these hairs are bristle-like and half as long as width of femora, decreasing in length, being very short at tip; hind tibiae slightly enlarged at tip, its hair wholly white, short, a few longer ones below at tip; anterior and posterior tibiae without bristles, middle tibiae with a small black bristle above and a yellow one on anterior surface near basal fifth; all tarsi plain, slender, fore and middle ones with short black hair; posterior tarsi with short white hair; length of fore tibiae as 55, of middle ones as 64; joints of fore tarsi as 25-20-14-7-7; of middle pair as 44-24-15-7-7; posterior pair as 16-38-21-9-8. Calypteres white with yellow margin and white cilia. Halteres pale yellow.

Wings nearly hyaline, veins yellow, third and fourth veins convergent; last section of fifth vein as 17, cross-vein as 15; posterior margin of wing nearly evenly rounded; anal angle rounded.

Female: about as in the male in general color and form of wings and feet.

Described from five males and two females, all taken by O. H. Swezey, at Honolulu, Oahu. Holotype, male, taken on a window; allotype, female, in cage in the insectary, December 3, 1914; two male paratypes were reared from compost, February 2, 1925.

Table of Species of Medetera Found in the Hawaiian Islands

1. All femora, tibiae and tarsi wholly yellow; scutellum with two pairs of bristles (Oahu) ..... *cilifemorata* Van Duzee
   Femora more or less blackened at base 2
2. Prothorax with white bristles above fore coxae; scutellum with two pairs of bristles; halteres yellow or slightly brownish yellow; first two joints of front tarsi as 21-21; first two joints of hind tarsi as 17-40 (Oahu) ..... *atrata* Van Duzee
   Prothorax with black bristles above front coxae; scutellum with only one pair of bristles; halteres black; first two joints of front tarsi as 23-17; first two joints of posterior tarsi as 15-30 (Hawaii) ..... *hawaiiensis* Van Duzee

SWEZIELLA new genus

Rather small species of Thinophilinae, differing from the species of Thinophilus in having the last section of fifth vein considerably shorter than the cross-vein; a distinct depression on posterior part of thorax and the proboscis long, something like the proboscis of Coracocephalus.

First antennal joint bare above, third a little longer than second, arista dorsal with very short pubescence, face of male nearly as wide as front, proboscis nearly as long as the face; palpi rather large; thorax with a depressed area on posterior slope of thorax before the scutellum; no acrostichal bristles; five pairs of dorsocentral bristles, all large; abdomen depressed, first five segments tapering; sixth and seventh segments widened, wider than those preceding them; seventh very narrow, but of nearly equal width throughout; hypopygium extending forward under the venter, about as in Thinophilus, reaching nearly to second segment, and with a pair of converging, lamella-like organs above it; wings with third and fourth veins nearly parallel; cross-vein considerably longer than the last section of fifth vein; legs long and slender; first joint of hind tarsi a little longer than second.

Swezíella albifacies new species.

Male: Length 4.3 mm. Front and face wholly covered with white pollen, face only a little narrower than the front, slightly narrower below, more than twice as long as the front, its suture a little above apical fourth, lower part as long as wide, obtusely pointed below; palpi black with white hairs and thickly white pollinose; proboscis reddish brown, about as long as the face, bent forward towards the tip in the type; antennae (Fig. 75) black, second joint rather large, third rounded at tip, as long as wide with scales of white pollen, but scarcely hairy, arista dorsal with very short pubescence, not quite three times as long as the antennae; a few rather long, pale hairs on posterior part of head.

Dorsum of thorax greenish, almost brown, with thin white pollen; on the posterior part is a large depressed area before the scutellum, which is more shining green; there are no acrostichal bristles; five pairs of large dorsocentral bristles, the anterior ones only a little smaller than the posterior; scutellum rather wide and short with one pair of large marginal bristles; pleura brown with white pollen.

Abdomen (Fig. 76) green, white pollinose, its hairs mostly black, it is depressed as in Thinophilus, narrowed towards tip as far as hind margin of fifth segment, but widened again to apical margin of sixth segment; seventh segment visible, narrow and of nearly equal width throughout; upper half of posterior end of abdomen hollow and projecting out of it near the middle of its vertical height is a pair of lamella-like organs, which are convergent, fringed with long hairs and project a little beyond the base of the hypopygium (Fig. 77), the hypopygium (Fig. 76) at its base comes up to these organs, or a little between them, it is composed of four segments, the last small, extending forward under the venter to a little in front of the posterior margin of second ventral segment.

Front coxae wholly yellow with a few small yellow hairs; middle and hind coxae reddish brown, more black at base on outer surface, posterior pair with a large, erect bristle on outer surface; all femora, tibiae and tarsi yellow, tarsi more or less blackened towards their tips; femora without

longer hairs below, posterior pair each with one small preapical bristle; front tibiae without bristles; middle and hind tibiae each with one bristle above near basal fourth, one near the middle and one at tip; length of fore tibiae as 35, of middle as 118 and of posterior pair as 130; joints of fore tarsi as 50-24-17-10-9; of middle pair as 59-35-19-10-8; of posterior pair as 48-43-25-15-10. Calypteres and their long cilia yellowish; halteres yellow.

Wings grayish; first vein scarcely reaching half way to the cross-vein, which is beyond the middle of the wing; third vein gradually, but only a little bent backward towards tip, so as to approach fourth vein a little at tip; last section of fourth vein straight, ending in the apex of the wing; last section of fifth vein as 17, cross-vein bent in the middle, its convex side towards apex of wing, its length as 27; sixth vein almost wholly wanting, just its base present; wings somewhat narrowed at base, the anal angle being rounded off.

Described from one male, taken by O. H. Swezey, May 18, 1920, on Mt. Kaala, Oahu. This male is the type of both the genus and species.

Hydrophorus pacificus new species.

Male and female: Length 4-5 mm.; of wing 4.5-5 mm. Whole fly, including legs, more or less densely white pruinose, but the ground color conspicuous on the thorax and abdomen. Face broad, wholly white pollinose, the green ground color is slightly visible; front with the brownish ground color showing, except on the broadly white pollinose orbits, seen from in front it is wholly white pollinose; cheeks forming a small lobe below the eyes, about half as wide as third antennal joint; palpi and proboscis white pollinose; antennae black, small, of about the usual shape, arista a little longer than antenna; one pair of postvertical bristles; nine black postorbital bristles, which reach down to the middle of the eye; beard white, mixed with black hairs, not very long or abundant.

Thorax green, dorsum sometimes reddish coppery with the humeri and narrow lines where the dorsocentral bristles are inserted white pollinose; acrostichal bristles in a single row, two or three humeral bristles; four scutellar bristles; prothorax with one black bristle and two or three black hairs above fore coxae, above these are a cluster of white hairs; anterior part of mesonotum with black hair; twelve or fourteen dorsocentrals in each row, one presutural, three superalar bristles; pleura with a row of minute white hairs above and in front of middle coxae. Abdomen green, hairs on the dorsum largely black and very small; on the venter white and rather short; hypopygium of male mostly or wholly concealed, shining black; fifth ventral segment projecting downward a little (if it were not for this projection it would be difficult to separate the sexes).

Fore and middle coxae with white hair, former with a black bristle near tip, hind coxae without hair or bristle; all legs and feet black, femora usually a little greenish, fore femora (Fig. 78, showing lower surface) thickened on basal part, with four rows of spines below, the anterior and posterior rows reach apical sixth, middle rows end near the middle, hairs on the sides black, on upper and lower surfaces yellowish white; fore tibiae (Fig. 79) with a rather close row of moderately long spines below, with one large spine at tip, hair on anterior surface white, on upper and posterior surface black or

mostly black, it also has three small bristles on posterior surface; hair on middle and hind femora largely black, whitish on lower and posterior sides, hairs on their tibiae and all tarsi mostly black; middle femora straight, hind femora bowed outward; length of fore femora as 85, fore tibiae as 65; joints of front tarsi as 35-16-16-12-11; of middle pair 54-30-25-19-14; of posterior pair as 45-23-27-17-15. Calypteres yellow with white hairs; halteres pale yellow.

Wings nearly hyaline; costa yellow on basal two-thirds; first vein and base of third and fourth veins yellow, remainder of the veins brown; fifth vein from the cross-vein to wing margin as 24, cross-vein as 17; usually the fifth vein does not extend much beyond the cross-vein, but sometimes reaches the wing margin.

Described from four males and seven females, all taken on the Island of Oahu by F. X. Williams in 1931; holotype, male, at Honouliuli, April 5; allotype, female, at Haleiwa, April 11.

This is much like *praecox* Lehm., the wing veins being colored as in that species, and the form of the male hypopygium about the same; but in *praecox* the hairs are almost wholly white on both body and legs, and the fore femora have one row of spines below in the male and two rows in the female.

Explanation of figures.

Plate 22

Fig. 1. *Chrysosoma fraternum* new species, antenna of male.

Fig. 2. *Chrysosoma fraternum* new species, tip of antennal arista of male.

Fig. 3. *Chrysosoma fraternum* new species, hypopygium of male.

Fig. 4. *Chrysosoma fraternum* new species, organ projecting from middle of lamellae of the hypopygium.

Fig. 5. *Chrysosoma pallidicornis* Grimshaw, hypopygium of male.

Fig. 6. *Chrysotus vulgaris* new species, mid tarsus of male, side view.

Fig. 7. *Chrysotus vulgaris* new species, hind tarsus of male.

Fig. 8. *Chrysotus spiniger* Grimshaw, antenna of male.

Fig. 9. *Chrysotus spiniger* Grimshaw, mid femur of male.

Fig. 10. *Chrysotus pallidipalpus* new species, antenna of male.

Fig. 11. *Chrysotus pallidipalpus* new species, palpus of male.

Fig. 12. *Campsicnemus brevipes* new species, antenna of male.

Fig. 13. *Campsicnemus brevipes* new species, front tibia and tarsus of male.

Fig. 14. *Campsicnemus brevipes* new species, mid tibia and tarsus of male.

Fig. 15. *Campsicnemus ciliatus* new species, mid tibia and tarsus of male.

Fig. 16. *Campsicnemus concavus* new species, hind femur of male, side view.

Fig. 17. *Campsicnemus concavus* new species, front tibia and basitarsus of male.

Fig. 18. *Campsicnemus flavicornis* new species, antenna of male.

Fig. 19. *Campsicnemus flavicornis* new species, front leg of male.

Fig. 20. *Campsicnemus flavicornis* new species, mid leg of male.

Fig. 21. *Campsicnemus flavicornis* new species, mid leg of male, another view.

Fig. 22. *Campsicnemus gloriosus* new species, antenna of male.

Fig. 23. *Campsicnemus gloriosus* new species, mid femur, tibia and basitarsus of male.

Fig. 24. *Campsicnemus gloriosus* new species, tip of mid tibia and basitarsus, showing the bristles straight.

Fig. 25. *Campsicnemus gloriosus* new species, tip of mid tibia, showing the bristles curved.

Fig. 26. *Campsicnemus gloriosus* new species, base of mid tibia, showing projection on the side.

Fig. 27. *Campsicnemus gloriosus* new species, antenna of female.

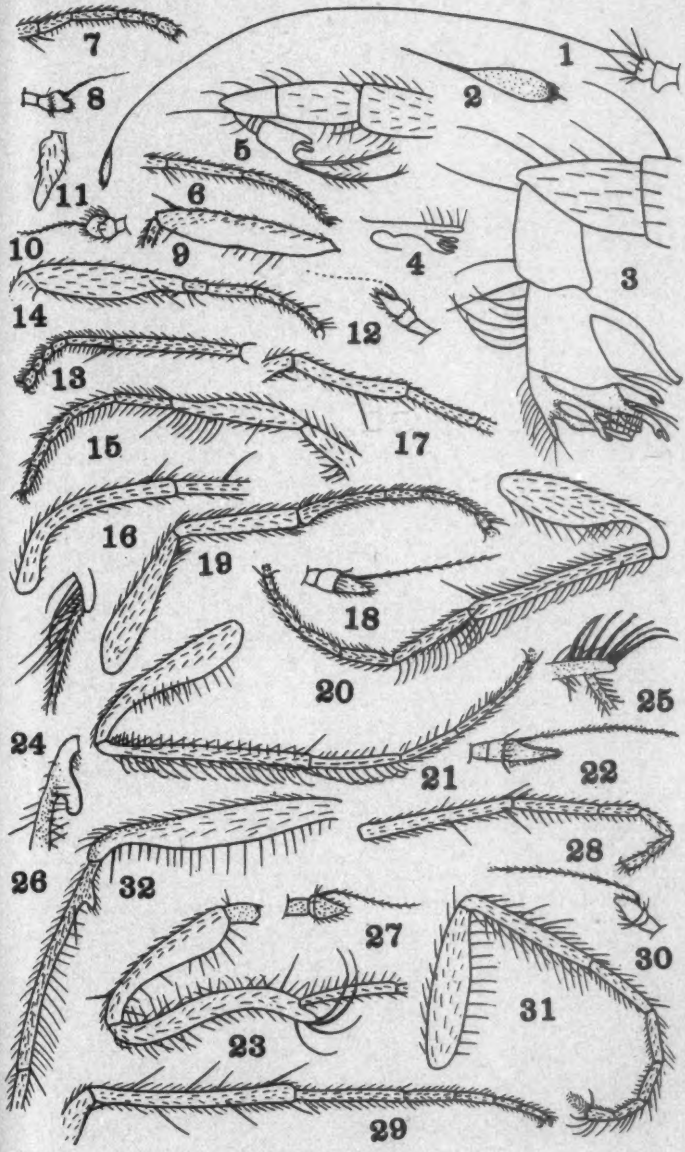
Fig. 28. *Campsicnemus gloriosus* new species, front tibia and tarsus of female.

Fig. 29. *Campsicnemus gloriosus* new species, mid femur, tibia and tarsus of female.

Fig. 30. *Campsicnemus grimshawi* new species, antenna of male.

Fig. 31. *Campsicnemus grimshawi* new species, front femur, tibia and tarsus of male.

Fig. 32. *Campsicnemus grimshawi* new species, mid femur and tibia of male.



Dolichopodidae

Plate 23

Fig. 33. *Campsicnemus nigricollis* new species, antenna of male.

Fig. 34. *Campsicnemus nigricollis* new species, front coxa, femur, tibia and tarsus of male.

Fig. 35. *Campsicnemus nigricollis* new species, mid femur, tibia, and tarsus of male.

Fig. 36. *Campsicnemus nigricollis* new species, base of wing of male.

Fig. 37. *Campsicnemus obtusus* new species, antenna of male.

Fig. 38. *Campsicnemus obtusus* new species, front tibia and basitarsus of male, posterior side.

Fig. 39. *Campsicnemus obtusus* new species, mid tibia of male.

Fig. 40. *Campsicnemus octosetosus* new species, antenna of male.

Fig. 41. *Campsicnemus octosetosus* new species, front tibia and tarsus of male.

Fig. 42. *Campsicnemus octosetosus* new species, mid tibia of male.

Fig. 43. *Campsicnemus ornatus* new species, front tibia and tarsus of male.

Fig. 44. *Campsicnemus ornatus* new species, mid tibia and tarsus of male.

Fig. 45. *Campsicnemus sinuatus* new species, antenna of male.

Fig. 46. *Campsicnemus sinuatus* new species, mid femur, tibia and basitarsus of male.

Fig. 47. *Campsicnemus sinuatus* new species, mid femur and tibia of male, another view.

Fig. 48. *Campsicnemus sinuatus* new species, base of tibia of middle leg, showing double projections.

Fig. 49. *Campsicnemus spinitibia* new species, front femur, tibia and tarsus of male.

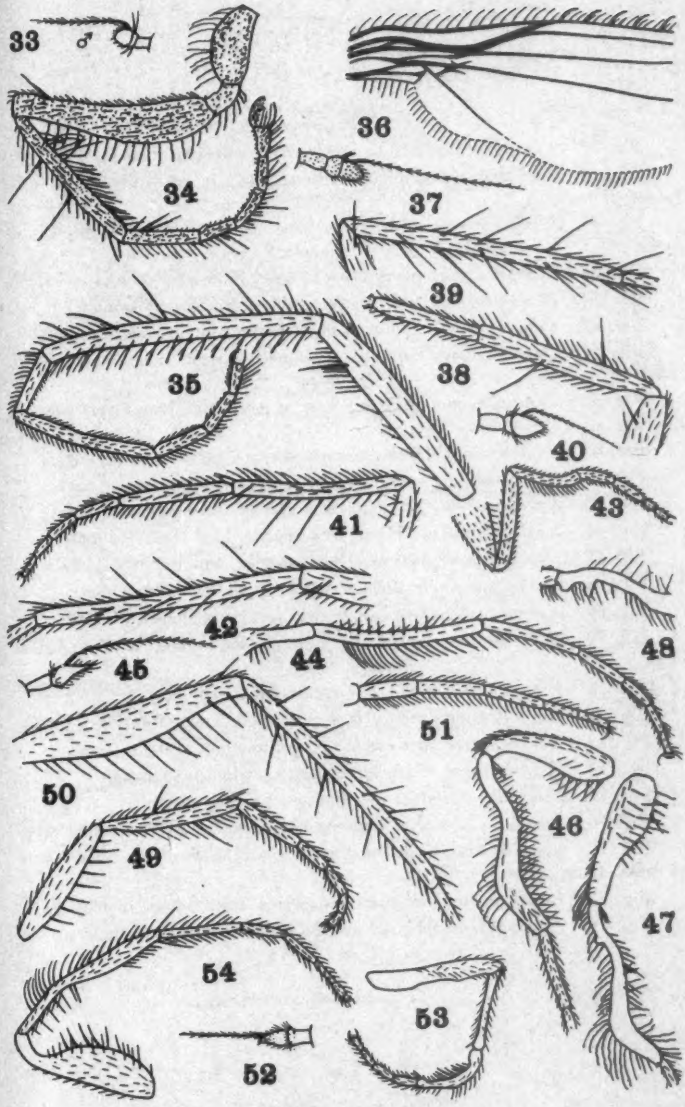
Fig. 50. *Campsicnemus spinitibia* new species, mid femur and tibia of male.

Fig. 51. *Campsicnemus spinitibia* new species, hind tarsus of male.

Fig. 52. *Campsicnemus strigosus* new species, antenna of male.

Fig. 53. *Campsicnemus strigosus* new species, front femur, tibia and tarsus of male.

Fig. 54. *Campsicnemus strigosus* new species, mid femur, tibia and tarsus of male.



Dolichopodidae

Plate 24

Fig. 55. *Campsicnemus tibialis* new species, antenna of male.

Fig. 56. *Campsicnemus tibialis* new species, front femur, tibia and tarsus of male.

Fig. 57. *Campsicnemus tibialis* new species, mid tibia and tarsus of male.

Fig. 58. *Campsicnemus tibialis* new species, hind tibia of male.

Fig. 59. *Campsicnemus tibialis* new species, antenna of female.

Fig. 60. *Campsicnemus williamsi* new species, antenna of male.

Fig. 61. *Campsicnemus williamsi* new species, front tibia and tarsus of male.

Fig. 62. *Campsicnemus williamsi* new species, mid femur and tibia of male.

Fig. 63. *Syntormon distortitarsis* new species, antenna of male.

Fig. 64. *Syntormon distortitarsis* new species, hypopygium of male.

Fig. 65. *Syntormon distortitarsis* new species, fore tarsus of male.

Fig. 66. *Syntormon distortitarsis* new species, hind tarsus of male.

Fig. 67. *Syntormon distortitarsis* new species, antenna of female.

Fig. 68. *Eurynogaster clavaticauda* new species, antenna of male.

Fig. 69. *Eurynogaster clavaticauda* new species, abdomen of male.

Fig. 70. *Eurynogaster clavaticauda* new species, middle femur and tibia of male.

Fig. 71. *Eurynogaster nitida* new species, abdomen of male.

Fig. 72. *Eurynogaster nitida* new species, mid femur and tibia of male.

Fig. 73. *Eurynogaster virida* new species, antenna of male.

Fig. 74. *Eurynogaster virida* new species, abdomen of male.

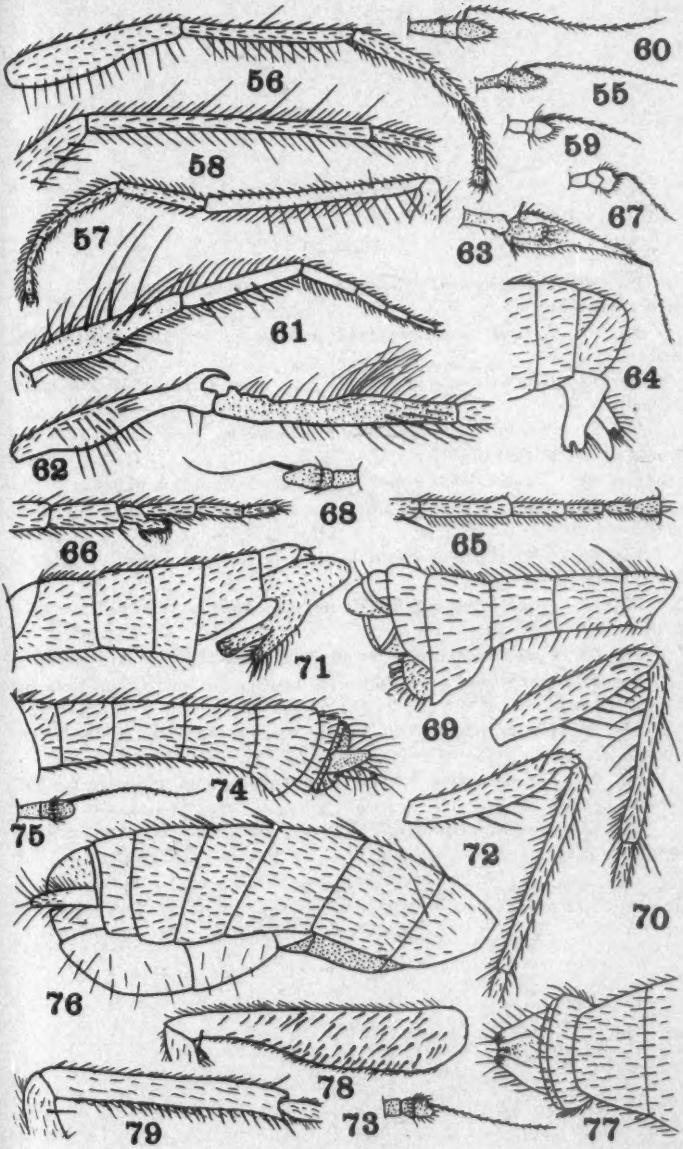
Fig. 75. *Sweziella albifacies* new species, antenna of male.

Fig. 76. *Sweziella albifacies* new species, abdomen of male, side view.

Fig. 77. *Sweziella albifacies* new species, apical segments of abdomen of male, from above.

Fig. 78. *Hydrophorus pacificus* new species, front femur of male.

Fig. 79. *Hydrophorus pacificus* new species, front tibia of male.



Dolichopodidae

Plate 25

Fig. 80. *Campsicnemus miritibialis* new species, hind femur of male, seen from above.

Fig. 81. *Campsicnemus miritibialis* new species, fore tibia and tarsus of male.

Fig. 82. *Campsicnemus miritibialis* new species, mid tibia and tarsus of male.

Fig. 83. *Campsicnemus miritibialis* new species, hind femur, tibia and tarsus of male, from the side.

Fig. 84. *Campsicnemus crinitibia* new species, antenna of male.

Fig. 85. *Campsicnemus crinitibia* new species, mid femur of male, anterior view.

Fig. 86. *Campsicnemus crinitibia* new species, mid femur and tibia of male, posterior view.

Fig. 87. *Campsicnemus crinitibia* new species, mid tibia and tarsus of male.

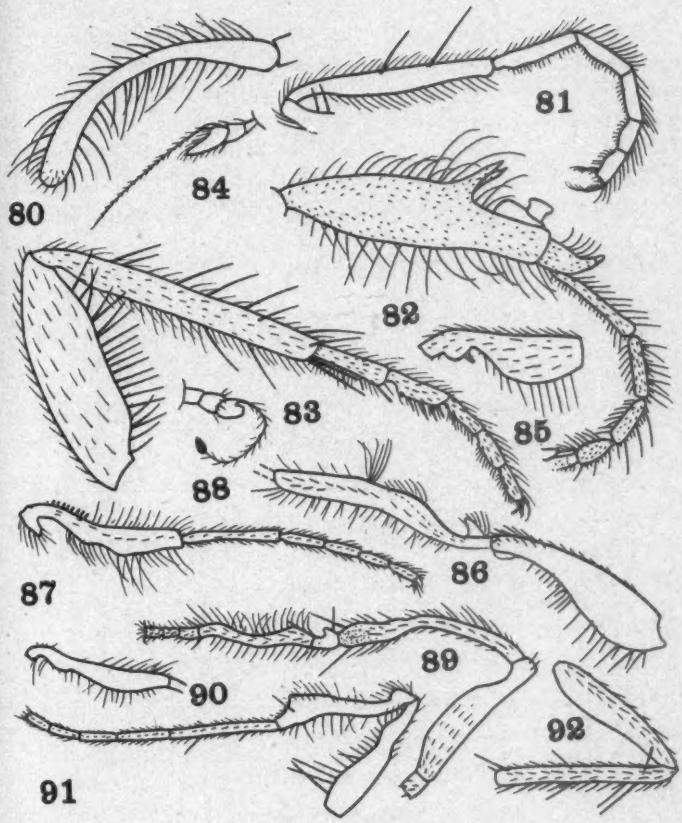
Fig. 88. *Campsicnemus nudifemorata* new species, antenna of male.

Fig. 89. *Campsicnemus nudifemorata* new species, mid femur, tibia and tarsus of male.

Fig. 90. *Campsicnemus bellulus* new species, mid tibia of male, one view.

Fig. 91. *Campsicnemus bellulus* new species, mid tibia, femur and tarsus of male.

Fig. 92. *Campsicnemus divergens* new species, mid femur and tibia of male.



Dolichopodidae

Records of Immigrant Insects for 1932

By the Editor

The occurrence in Hawaii of the following immigrant insects is recorded for the first time in this issue. Those of the list marked with an asterisk were observed for the first time in the year 1932. The other species were already known to occur here, some of them for a number of years, but they had not been identified previously, and herein their names are used for the first time in Hawaiian literature. For details of records, etc., refer to the pages given.

Page

Contarinia maculipennis Felt. Hibiscus bud midge 212, 236, 247

Hierodula patellifera (Serv.) Mantis on Kauai 212

Mezium americanum Lap. Ptinid beetle 221

Stenomicra angustata Coq. (Diptera) 223

Empoasca solana De Long. Amaranth jassid 226

Agrilus extraneus Fisher. (Col.: Buprestidae) 228, 249

**Tromatobia rufopectus* (Cresson). Spider egg-parasite 230, 236, 274, 305

**Hecamede albicans* Meigen. (Diptera) 230

**Gymnopa* sp. (Diptera) 230

Hermetia illucens (Linn.). (Diptera) 232

**Phygadeuon* sp. Ichneumonid wasp 233

Stenotrupes filum Fairm. Small weevil on sugar cane 235

**Toxomerus marginatus* (Say). Syrphid fly 236

Acythopeus gilvonotatus Barber. Orchid weevil 241

Hypoderma lineata De Villiers. Ox warble 242

**Taeniothrips gladioli* M. & S. Gladiolus thrips 244